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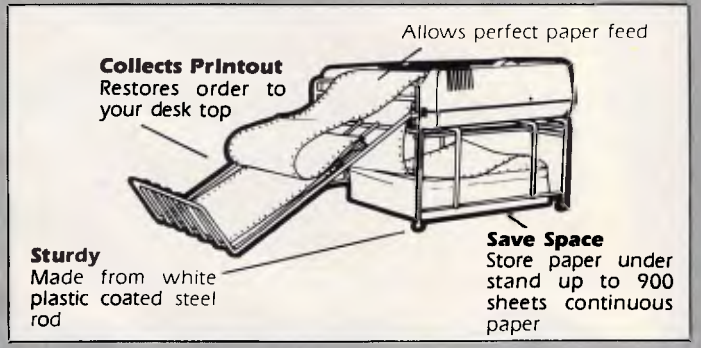

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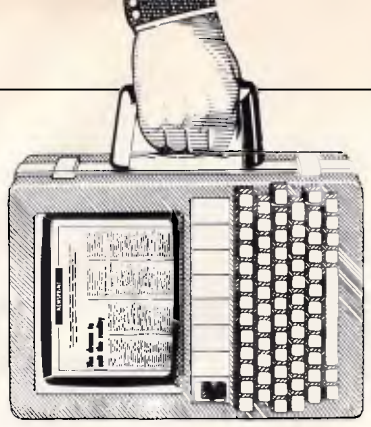

Disappointing though the West Coast Computer Faire may have been, there were some items of interest. Guy Kewney reports.

All the fun of the Faire

Despite fears that it would be a waste of time, I visited the eleventh West Coast Computer Faire. It proved to be an excellent trip. I found PC Outline, a 'shareware' outline processor costing $US10, which is very much better than Think Tank. I found the latest version of PC Write, another shareware product and a wonderful word processor. A chip designed to run Forth (the chip designed by the man who designed the language) was available in a kit for $US400. There were lots of assemblers, editors and compilers for every conceivable type of micro. And IBM was there, with its Convertible.

Nonetheless, the show is a shadow of what it was. Silicon Valley, where all the micro companies have their roots, was where all the new ideas came from. Adam Osborne, four years ago, announced his revolutionary 'portable' CP/M machine. Microsoft always hosted a vast party. The media gave their biggest 'award' parties. Thousands (literally) of small entrepreneurs showed their bright new ideas in tiny lemonade-stall booths, hoping that next year they'd be hosting a big party on the profits of fame. For some, it even happened.

Two years ago the Faire was in a state of terminal decay, having been sold by its original founder and organiser, the enthusiastic amateur Jim Warren, to Prentice-Hall, a group of 'professional' conference organisers who wanted to make it a business-only show. This year, almost on the point of vanishing into oblivion, the Faire was taken over by another professional show organiser, Interface Group. Interface is no stranger to big, boring business conferences, and all the Silicon Valley enthusiasts shuddered at the thought of what might happen.

Amazingly, the signs are good. The first thing that the Interface Group boss, Shelley Adelson, did was to hire Jim Warren and enlist his help in putting the old-style show back together again. Warren must love the show, because he agreed. He made (I guess) two million dollars selling the show to Prentice-Hall, and has been using some of that money to run a vigorous campaign, aiming to be elected County Supervisor and stop the 'extortion' of money out of poor country-dwellers (like him) by a rapacious San Mateo County Planning office. (In fact, unlikely though it may sound, he seems to have a point. The Board of Supervisors recently voted to make the use of plastic plumbing pipe illegal in country areas — it's a 'fire hazard', they say — even though town-dwellers can use it. There are more votes in town . . .)

His first bit of advice to Shelley Adelson was: 'You've got to give something back.' The next thing he advised was: 'Keep the conference sessions.' Amazingly, the old days, when people queued up to present papers to the Faire, had almost gone, with the previous organisers downgrading the major attraction simply because it didn't make a profit on its own.

To everyone's amazement, including that of writer Jerry Pournelle, Adelson seems keen to do this. 'This is my favourite show,' Pournelle told a huge audience of adoring computer nuts from the Bay Area, and everyone applauded — me, too. It's great to see some hope for the future of this show after two dismal years, and I look forward to next year's Faire.

Guy Kewney

The price of optical character recognition units has, and will continue, to fall. This one from Remington sits neatly between a PC's main system box and monitor.

The PC-Scan takes approximately 25 seconds to process a typed page and its output is compatible with most word processing programs. Remington sells it for $7800; call (02) 269 0925 for details.

PC Outline

There was a time when using an outline processor meant that you were more concerned with what you wrote than how it appeared on paper. With the arrival of PC Outline on IBM machines, this is over: this outliner is a lot easier to use than many word processors, is infinitely more powerful,

and is vastly faster.

An outline processor can be intricate and complicated; PC Outline proves that its job is simple. An outline is like the contents page of a book. The clever part of an outline in a computer is that you can read the chapters without moving off the contents page. Each chapter can be a contents page of its own, and you can see that as a series of headings, or as a series of paragraphs. It makes planning a long piece of text very simple, because you can plan and write at the same time. As the plan changes, you turn sub-heads into major heads, turn major headlines into footnotes, and shuffle them around.

With PC Outline, you get something else — you get nine different outlines at the same time. One can be all over the screen, hiding the others. Then again, it can occupy just the top right-hand corner, or any other part of the screen. Others can sit next to it, or can be above it or below it. You can see all of them, if you like. Switching from one to another is like using Microsoft Word: you just move from one window, instantly.

PC Outline is a lot quicker than Word. Alt-1 shows window one. Alt-2 shows window two — and so on — bang! One of my windows now contains my name-and-address list. At a split-second's notice, I can find the phone number of anyone (if I have it on file) and a second later, I can add a new one. The list, however, isn't just a long file: all you see when you look at it, is the names. Search for one, however, and the sub-heads open up, showing phone number, names of executives, when you wrote about it, and (in emergencies) what you said about it — all hidden until needed.

Unlike other outliners, PC Outline can use as much or as little memory as you like. I'm currently loading the program with the instruction which sets it to use just 300k out of the 640k on the Olivetti M24, leaving just over 243k free after the operating system has been squeezed in.

Now, the crunch: PC Outline can be used as an ordinary program, or it can be used memory-resident. Memory-resident programs, such as Sidekick, allow you to load and run other things — communications programs, spreadsheets, text editors and even outline processors — but with the magic option that if you press a certain key, suddenly you're running Sidekick — or, in this case, PC Outline.

The text editing capabilities are excellent. You can't type fast enough to stop PC Outline from reformatting a paragraph as you type. Finding any string anywhere in the file takes a split second. The print options are vast, easy to understand, and simple to operate. What word processor can you say that about?

You can create macros (keys which type whole sentences), and you can arrange for macros used in another program to be dropped when you switch to PC Outline.

And if that isn't enough, there is the price. A fully-registered, paid-up user, entitled to the manual, full telephone support, and any program updates, pays an amazing $US49.95 plus $US5 shipping charge. But the program is *not* copy-protected, and indeed, the whole concept of 'shareware' requires that it should be not only copyable, but copied. 'In fact,' says the opening screen when you sign on, 'we encourage copying. The diskette can be freely copied and shared. We also encourage you to register your copy. With registration you get the most recent version, a typeset copy of the manual, automatic notice of future program updates, and telephone support.'

Dave Winer, author of the US's seminal outline processor, Think Tank, told me he was 'really upset' that the author of PC Outline hadn't come to him. Apparently, the man had been touting this excellent program around all the publishers in the world, and eventually went for shareware as his marketing basis simply because he had no options. 'We could have used a really able technologist like this guy,' said Winer sadly. I can see his point. Up until receiving this product, I used his. I've now deleted Think Tank from the hard disk.

But Winer advertises Think Tank. On the Macintosh, he hardly needs to — it's an excellent outliner, and almost the only act in town. On the PC, however, even though (sorry, Dave) his product is, by comparison with PC Outline, a bag of worms — full of bugs, slow, disk-hungry and primitive — he will nonetheless outsell PC Outline, simply because PC Outline doesn't have an advertising budget.

Anyone who wants a copy on a 5.25in diskette, send the disk to me with a sufficient quantity of stamps and a strong disk holder, and I'll be delighted to make a copy (as soon as I have time, and as soon as I get around to it) for you to try. Those without infinite patience write to SoftWorks Development, 750 Stierlin Road, Suite 142, Mountain View, California, 94043, and send your $US55. You won't be sorry.

Guy Kewney

Dennis Lillee has been dumped from Ray Martin's Midday Show using Mitsubishi's Video Printer.

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vant and slow, the micro business is, today, overlooking a revolution in the data processing field — a revolution which is not a couple of years away, but just a couple of months.

The name of the new family of products is 'information appliances'. They are the invention of Jeff Raskin, who set up a venture-funded California company called Information Appliance Inc, to develop them. I've just seen them, and I am amazed. Raskin has as good a claim as anyone to be the man who made Macintosh happen for Apple. He took several ideas, including Alan Kay's windowing, mouse, icons and Smalltalk ideas, and put them together into the Book of Macintosh inside Apple. Several years later, Apple laboured, and brought forth the beast.

Today, Raskin reckons — and I agree — that he has gone several steps forward, simply by stopping himself from making computers. You can get an idea of what he's done by trying out his Swyftware on the Apple IIe. Swyftware is a disk. It includes software on the Apple, plus all data, and is 'autocloning'. What does it do?' It does word processing. It does information retrieval, telecommunications, calculations, and even allows you to use the Apple as a programming environment,' adds Raskin, 'without menus, without mice, without windows, without function keys. It only has five commands, and it breaks all known principles about the way things are done these days.' What makes the whole thing sound incredible is that it takes 16k of code. And it is fast, fast, fast — the fastest thing you've ever seen on an Apple IIe.

A computer, Raskin notes, is 'a device for running programs.' He isn't building one of those; he's making devices with very specific functions. He claims to have a spreadsheet function device ready, but I didn't see that: what he showed me was the text/data/comms/Basic machine, in his home in a small concert hall high in the Los Altos mountains, south of San Francisco. After he told me what it was, I must have looked a little sceptical. 'Come and see,' he said.

I sat at his elbow and he showed me the Apple screen. 'This isn't the appliance,' he explained. 'This is a program to run on the Apple which looks like the appliance. The real appliance is very much bigger, and faster.' It's hard to imagine how it could be bigger and faster. The screen was covered in 80-column text, and Raskin pointed to the cursor. 'Show me somewhere on the screen,' he said. I pointed to a word near the bottom. Without cursor controls or mice, the cursor leaped to that point. The magic command is 'Leap', and it works a little like a Find/Replace command in word processing. The difference is that the computer doesn't wait, dumb and idle, while you type in the search pattern, but starts immediately.

For example, suppose the word 'where' is at the bottom of the screen: you hold down Leap and start typing the word. As you type the 'w', the cursor leaps to the next 'w' onscreen. When you add the 'h', it has moved immediately to the next occurence of 'wh', and normally, within three letters, you're there.

With cursor keys, you'd have to think: 'I could hold the 'down' cursor until I reach the bottom line, then I could hold the right-arrow. Or faster, I could do a 'move-to-end-of-line' command, and go back five spaces. Or a 'bottom-of-page' command, up two lines, then back. Now, what is the bottom-of-page command — control-down-arrow? Or PgDn? With a mouse, you have to take your hands off the keyboard. Few typists enjoy this.

As Jeff Raskin said: 'I find a hand-to-mouse existence very annoying.'

It sounds too simple to be clever. Wait till you see it, though. You can leap to letters, characters, carriage returns (which always appear at ends of lines), double carriage returns (paragraphs), and numbers. How do you format a disk? You don't. Put in a disk and press the 'disk' key. The data in the machine is transferred onto the disk, while formatting (if blank) in around eight seconds. Should the disk be already Swyftware-formatted, it won't let you transfer the data until you highlight the bit you want to transfer (that could be the whole disk). And it certainly won't let you abandon the previous disk without saving any changes.

File names? There are none. 'We have known for 30 years that file names don't work,' said Raskin. 'The two times you want to use them is when you have an idea and want to start putting it down, when it gets in the way, and the other time is when you try to retrieve the idea, and can't remember the file name you gave it last week.' But you can remember that it was a note from Bruce, a comment on a Porsche, or some other key word. It may even be a letter you wrote on 26 May, So: Leap! Hold down the Leap key and type 'Porsche', and no matter where it is on the disk, you'll have that in front of you in less than 300 milliseconds.

Possibly, there were two letters on 26 May: press Leap again, and you find the second. And it really works.

'One of the principles we worked on was that frequently chosen tasks should be very fast; less frequent tasks should take longer,' Raskin says. The command to operate a modem is 'Send' and the command to operate a printer is 'Print', and the system can cope with incoming electronic messages while the user is typing in text. This is something only possible

$2995 will buy you one Leading Edge Model D PC-compatible. It comes with dual 5¼in floppies, 256k of RAM, "hi-res" monochrome monitor, Hercules graphics emulation capability and a bundle of software. It seems to be causing a bit of a stir in the US; naturally its Australian distributor feels it will do the same here (predicting a 10% market share within 12 months). Call (02) 958 2197 to get the full story of the distributor's enthusiasm.

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because there is no operating system.

'The normal approach is to take this great, big, ugly thing called DOS, and put a cosmetic thing over it to make it seem friendly,' says Raskin. 'We've junked the whole concept.'

An awful lot of people who ought to be taking this concept seriously are refusing to consider it, because they simply don't believe it.

Others are doubting its usefulness. Their attitude reminds Raskin strongly of the time when the mainframe business ridiculed the concept of minis, or the time the minicomputer business dismissed micros. Measure the information appliance by microcomputer requirements, and it doesn't measure up. But Raskin likes to recall the Benchmark he proposed, once, to a minicomputer maker. 'OK, your machine will win a floating-point Benchmark. My turn. Pick up your machine, and I'll pick up mine, and we'll time how long it takes each of us to get to the door.'

You measure the appliance by the number of things a user can do with it, without having to wonder what the difference is between a data disk and a program disk; or by the speed in which the screen jumps from one page to another; or by how few commands the user absolutely has to remember to get information in and out. Raskin set out to have 10 commands ('it was enough for Moses') and claims to have got it down to five — Leap, Calc, Disk, Send and Print.

Rigorously, you could argue that there are other commands (if you like to call them that) which are typed in and executed with the 'Calc' key. Turning the screen from 80-column width to 35, for example, involves typing 'width=35' and pressing Calc. The operation is virtually instant. Double-spacing is similar.

Raskin doesn't believe his appliances will replace computers. 'People will need to have computers to run programs. For example, you could use an information appliance to send the same letter to 25 people, by simply leaping and inserting commands. But for a longer list, you'd want a mail-merge program,' he said. On the other hand, he does believe there is a bigger information appliance market than a micro market, and there are surprising opportunities for the use of information appliances outside offices.

Without breaking confidences, I can't describe what Raskin showed me in detail, but his plans for numerically controlled (NC) three-plane working machinery invove a breakthrough that will destroy existing pricing. It won't just take 20 per cent or 30 per cent off current prices, it will mean that equipment which costs $20,000 now, will cost $5000 by the end of the year.

The Apple-based product, useful and powerful though it may be, is not the real appliance. That will be out, in two (possibly three) forms later this year. Raskin has been financed by venture capital to the tune of $US5.6m in two rounds, the second coming in June 1984 (when no-one else was getting venture funding, he points out). 'After three years, we still have half the money left in the bank, and have always been within 5 per cent of budget. 'Unusual,' he remarks, 'but perhaps not newsworthy.'

Impressive though that finance may be, it isn't enough. To produce and launch on a sufficiently large scale, information appliances would need tens of millions, even hundreds — and that isn't available. Therefore he is licensing the designs to 'another group'.

The first two prototypes are in Raskin's home, and I saw them. One is battery-powered; both are portable. They have a Motorola 68000 processor, and instead of the 40k provided by the Apple II, they offer

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exactly the same speed in 240k. That's a lot of text. The $US800 appliance will include a modem and a disk, and optionally, a printer. There is no on/off switch you just start typing. The mains-powered version has a video screen (white, with black type) and the battery version has an LCD screen.

In a couple of years, Raskin predicts, all the people who are today dismissing the concept as ridiculous, will be building and selling information appliances. 'It's a new market, that's all.' His pre-appliance sells for $US80 on an Apple IIe. You need a single disk, an 80-column extended card, serial and parallel cards, plus a printer and a modem. For those of you without those things, it's almost worth buying them, just to try out the idea. It's amazing.

Guy Kewney

Share and share alike

Shareware — software that is free, and you pay for it if you like it — was the second most obvious trend at the Faire. It's a way of making a little money, for a software author, with the hope that one day, when the program catches on, you may make quite a lot.

For the author of PC Write, Quicksoft, the dream is starting to come true. It has staff, the beginnings of an income, and thousands upon thousands of users who simply made a copy and decided that they didn't need a manual, so never bothered to register.

Quicksoft charges $US75 for a registered copy of PC Write, and has just launched the new 2.6 version.

This is a complex product in terms of what it can do — that is, it can do just about anything. If I start listing its features, this issue of *APC* won't be printed, and I'll leave out five or six items that you, probably, would regard as vital. But a colleague who is using it has stars in his eyes, and says it does *everything*! It even allows you to specify what code will mean 'end-of-file', and as a registered user, you get the source code to allow you to change the program yourself.

Quicksoft is contactable on (206) 282 0452, in Seattle, Washington.

Another new 'shareware' package is the database, File Express.

This program is just one of many which makes pundits gloomy about the chances of survival for fringe database producers such as Infocom, with the struggling Cornerstone.

File Express is not only virtually free, but it has been described as 'really easy' to use by serious reviewers, and seems to have rather more features than rival products such as PFS: File, or Executive Filer.

The producer, Express-ware, is in Redmond, Washington. Details on (206) 481 3040.

If shareware was the second most obvious trend at the Faire, the most obvious trend was 'shells' for IBM PC-DOS — programs to guide non expert users through the minefield of copying, directories, formatting and filenames.

The same thing is now possible on IBM micros, with assembly language, through an 8086 interpreter of assembler instructions from Morgan Computing.

Advanced Trace 86 has annoyed the pundits by not being entirely compatible with Microsoft's assembler program — code developed on it has to be edited before it will be accepted by Microsoft's program.

The author, Morgan Computing, poo-poohs this: 'We include a nice little utility program which strips off the first field in our output, which is the actual machine code,' staff said — and apparently, the numbers in this field are the only incompatibility.

There is one product which is both shareware and DOS shell: Dosamatic, which was shown by enthusiasts.

Dosamatic is like Xtree, which does a good job of guiding you through the problems normally associated with trying to manage IBM's disk operating commands. Others under this heading include JOBS, from RCT Design, Q-DOS (or QuickDOS), and Jobs, from RCT Design.

Details of Dosamatic are available by contacting Steve Mykytyn through CompuServe at userid 72447, 2372. 'As in the past,' the company notes, 'you may write or call Mann Pacific Software.' Unfortunately, I don't have this company's phone number.

If arrogance is a sign of quality, PathMinder must have been among the better shells at the show, I can't confirm this personally, because the arrogance of this Austin, Texas company extended to the point where it informed me that it 'didn't know what it was you have to do to register as Press for these shows, but it seems just anyone can get in and ask for free software.'

A pity, because PathMinder is memory-resident, and the one thing I do ask from a DOS shell is that I don't have to interrupt a program, close down all the files and find the shell, before moving a file from directory A to directory B. I'll be contacting the company for more details just as soon as my temper recovers.

The price of PathMinder is $US40, and details are on (512) 474 4666.

QuickDOS, at $US30, is available from Gazelle Systems in Utah, on (801) 377 1288.

There was once a mouse which originally started out as a better mouse: its inventor called it a 'hedgehog' because of the buttons sticking out. The name,

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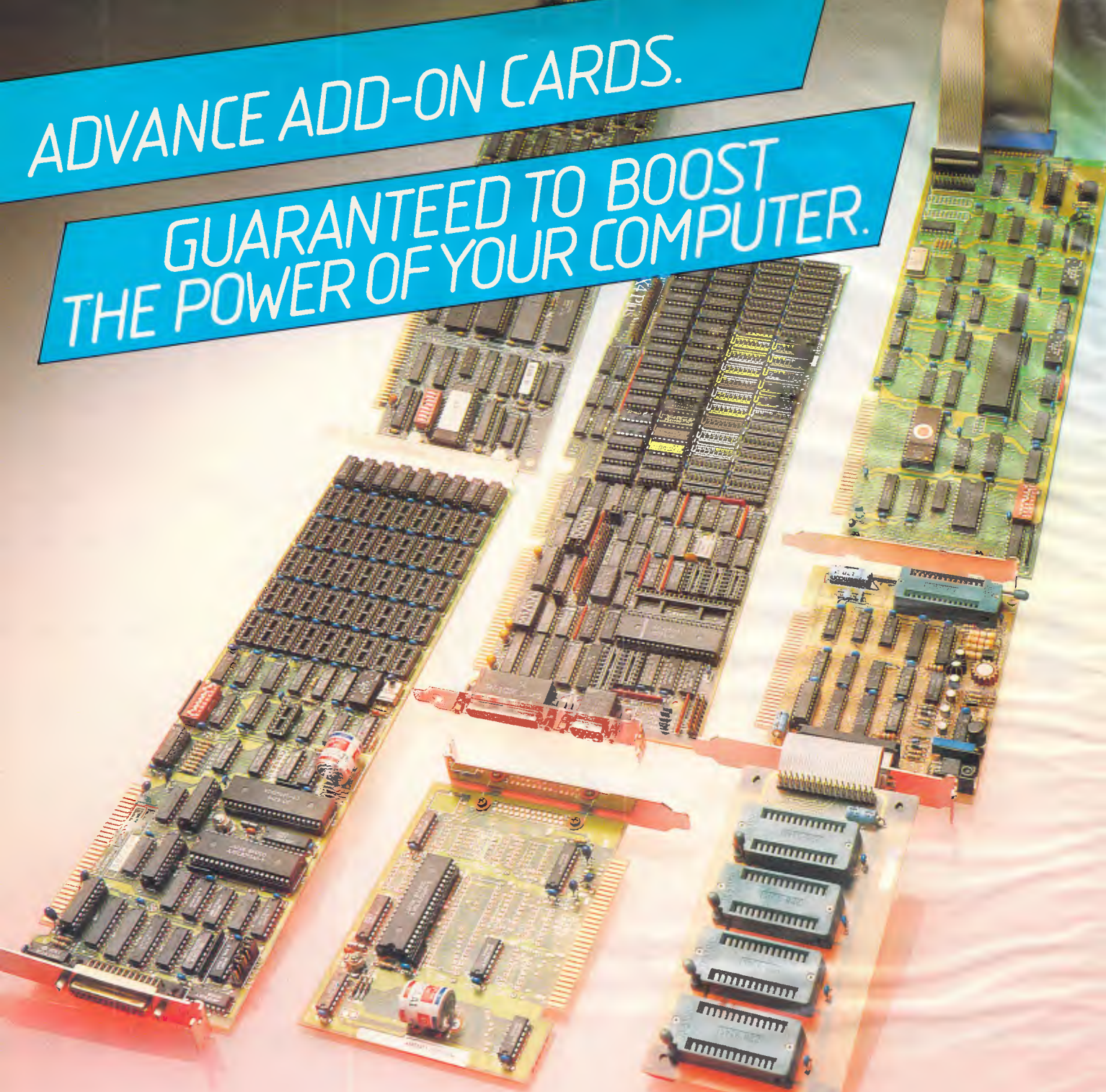

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EXPANDING COMPUTER POWER

however, didn't stick. So, if you can't build a better mousetrap, how about a better mouse interface? Logitech, the Swiss-based originator of Modula and the Logi-Mouse, has picked Lotus 1-2-3 as the way to do exactly this.

The company demonstrated an interface 'which totally integrates our mouse into 1-2-3,' at the Faire.

'It eliminates the jerky cursor movement and the annoying delays and beeping you get with other mice,' Logitech claimed, adding: 'It makes 1-2-3 look like a mouse-based program.'

Other software uses a new piece of utility programming to use this mouse: this 'automatically' customises the mouse for any business graphics, or CAD application.

The arguments for and against Basic are often not about Basic at all, but about the convenience of having a Basic interpreter always ready to run, however much of the program you want to write.

For the ability to run a test section of code *backwards*, that seems a small price to pay. The company is based in Texas, in Carrollton. Details on (214) 245 4763.

The kind of job that we most earnestly need a computer to do is a dull, mindlessly repetitive one which has to be done exactly right every time.

Operating a spreadsheet is exactly this kind of task. One of the things Lotus 1-2-3 users like about the package, is that the sequences of keystrokes which make using it a chore can be automated. These are called 'macros', and the development of a useful macro to move one cell over, two up, enter a standard formula, pause for a number . . . and so on — working it out can be complex.

That, in a nutshell, is what Macropac International is hoping to make money out of.

The company has a disk which contains '101 macros for Lotus 1-2-3'.

'The macros included are a kind of folklore, presented in such a way that both novice and intermediate 1-2-3 users can benefit from someone else's experience,' says one reviewer, quoted by the company.

A lot of people will remember the Dick Smith Challenger, (and for a variety of reasons), especially those who bought one of them. Well, the UK company which produced the machine has now set up in Australia and is about to begin marketing PC, XT and AT compatible machines. In fact, they'll even soon be made in Australia. Prices start from a very attractive $2395 including some bundled software. Ferranti's telephone number is (02) 698 5544.

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Macropac International is in Cupertino, California. Details can be obtained by writing to 19855 Stevens Creek Blvd, Suite 168, Cupertino, Ca 95014. Price is $US50.

Typically, local area nets cost upwards of $US600 per user extra, on top of the cost of their micros. Can there be a true local area network, costing $US99 per node? 'A wild claim,' said the experts.

The claim was made by Applied Knowledge Groups, for Knowledge Network. The product was unveiled at the show, and its claims are compelling enough that I think we seriously ought to try the system out in our offices.

Briefly, the idea is to use the standard serial ports in IBM micros, and wire them together through phone jacks.

The Ethernet principles of a collision detection system are used.

If the net can run at only 57 kbits per second at its quickest, it is far from the fastest local net, but for sharing printers, disk space and programs, the price, at least, is right.

The company is based in Mountain View, California, tel: (415) 965 1300.

If Unix is pushed down all our throats, it won't be the first time that a need for common standards has forced a step backwards in computing. Ben Rosen, American financial guru, says it 'is not a personal operating system.' Those who agree with him now have to analyse Wendin's $US99 product, PC Unix, launched just before the Faire.

Behind the low price is a secret; the secret is that Wendin has not paid for a Unix licence.

Its version of Unix runs MS-DOS programs, and offers multi-user and multi-tasking facilities, as well as the 70 Unix commands which Wendin regards as 'the most commonly used features of Unix.'

With this version, unlike official Unix versions, you get the source code, which can make life easier for a professional programmer writing software for your system. And Wendin has shrunk it down so that 'the entire system is packaged on four diskettes, and requires approximately half an hour for a typical user to install,' says the company.

Furthermore, 'it requires so little storage space, it can be installed and run on a 5Mbyte hard disk. By contrast, comparable Unix operating systems for the PC are on 25 or more diskettes, and require as much as 13Mbytes just to store the system.'

At the same time, rival firm Microport was offering a genuine Unix V, licensed from AT&T, and available for the chips in the AT and compatibles.

This is cheeky. Microsoft has announced that its latest Xenix is compatible with Unix V, but AT&T recently annoyed Microsoft immensely by saying that it isn't. Microsoft just went public and (in the States at least) can't issue ripostes.

Wendin is contactable on (509) 235 8088, and Microport is on (408) 688 0286. I think those phone numbers (8088 and 0286) must be collectors' items in Silicon Valley.

Two years ago, a colleague returned from California with a personalised message, Macintosh-generated, on her tee-shirt, and ever since, my people have been asking: 'Where can we get a ribbon with tee-shirt ink?'

The answer is: Underware, a company in Sunnyvale.

The company now has ribbons for printers other than the Apple ImageWriter: the list includes the NEC 8023, the Epson MX and FX, the Star Gemini, and the Okidata Microline.

The ink is printed in reverse on special paper, and transfers (iron-on) to fabric.

The new MacPlus is faster than the old Mac, but I still can't get one. For Macintosh owners with little patience but plenty of cash, Levco has introduced an 68020 add-on board.

The Prodigy 4 is not cheap: the company was curiously coy about exactly how much it would cost. Best estimates are around the $US4000 mark.

But it does speed up the Mac, says Levco, and what is more, it allows an enormous amount of memory to be added. And in order to prove how compatible with the standard Mac it is, the company hired every conceivable demonstrator for every known software company to spend time on its booth running its software.

It was fast — apparently, four times the speed. It looked like at least that.

More fascinating, though less obviously epoch-making, was Levco's non-rotating fan.

This product has a price: $US60 for a kit, $US70 installed. It uses a piezo-electric quadrature technology: the material changes the shape when power is fed into it. The blades 'flap' fast and (apparently) silently.

Details from Levco in San Diego, on (619) 457 2011.

Detractors of Amstrad's 'old-fashioned' 8-bit micros point out that you can get marvellous pop-up utilities such as Sidekick for the IBM family, but not for CP/M.

This is no longer true: a 'Sidekick for the Amstrad' is possible, after all. A product from Poor Person Software is now available in CP/M Plus version.

The product costs a low $US50, and provides a notepad, a directory manager, a calculator, a modem driver for simple comms down the phone, a calendar and a hex calculator. There is also a key definer: you can feed macros in, like Smartkey (something Sidekick can't do).

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I wasn't surprised to find that neither Atari nor Commodore showed up at the Faire, leaving publicity to local user groups, although I had expected more evidence of the Atari ST range. Staying away was a mistake neither Apple nor IBM made.

New products for the Amiga, however, were in evidence, with the most impressive being a whole catalogue of launches from Micro Forge.

These products are mainly upgrades for the Amiga hardware. Products include a seven-slot expansion system, a second diskette drive, twin MS-DOS disk drives (5in) shown working with the MS-DOS emulator, plus hard disk and memory expansion — all a lot cheaper than rival products.

Micro Forge says all products are available now (May) and will send price lists. Details on (404) 688 9464, in Atlanta, Georgia.

Atari should have shown its Mac-emulating cartridge. It was represented at the Faire by the San Leandro Computer Club, which sponsored a symposium (I didn't attend) with Sam Tramiel, president of Atari, speaking.

The cartridge is 'not a complete emulation system,' but it does allow, says the Club, more than 1000 titles already written for the Apple Macintosh to be transferred to 1Mbyte STs without modification. And, the Club adds, the programs then run around 20 per cent faster.

Anyone wanting to set up links with the Club can contact the president, Bob Barton, on (415) 352 8118. The cartridge details are with Data Pac Inc, on (213) 821 2623.

Convertible software

Borland International is one of several companies which have already hopped into converting their range of software to the 3½inch disk format used by IBM's new convertible laptop PC. Borland programs (including Reflex and SideKick) should be being shipped by the time you read this. Existing owners of Borland software will be able to purchase 3½inch disk versions of their programs for a nominal sum. Owners will not have to return their 5¼inch disks in order to transfer to the convertible format.

Amiga now PC compatible

Commodore is taking the Amiga to its limits by announcing a new hardware device called Sidecar, allowing the Amiga to run PC software.

Sidecar, which is actually a cutdown PC, connects to the Amiga via the interface slot and happily runs Flight Simulator, Lotus 1-2-3 and other PC applications.

With 60 software titles for the Amiga already in Australia, and another 68 expected in a couple of months, Sidecar will open the door to a wealth of PC business software currently available.

Sidecar has a stock standard 256k RAM, 5¼in floppy drive and has three spare slots available for hard disks, communications cards and so on.

Sidecar is represented as an icon on the Amiga's screen and by clicking the mouse's cursor immediately boots the system into PC mode enabling the user to switch from pretty graphics to 1-2-3 instantaneously.

Manufactured by Commodore in Hong Kong, the first shipment of Sidecar is expected in Australian stores sometime in June and should sell for approximately $699.

Some details of Atari's PC emulator for its 1040ST are included in the Seventh *Australian Personal Computer* Show preview elsewhere in this issue, but *APC* has been unable to get its hands on one by press time. Watch for a comparison of the units in a future issue.

Maria Bokic

The coming fad

Producing compatible software may become as big a business as making PC-compatibles, forcing software prices down in the same way that 'me-too' machines have forced the market leader, IBM, to drop its PC prices (or offer rebates, which seems a feeble way to sidestep any claims that competition has forced IBM to lower its prices). In the US, SoftKlone Distributing Corporation is selling Mirror, a $49.95 knock-off of Crosstalk 16 (retailing for $195). And Adam Dsborne is having some success with his Paperback Software International, a company which includes in its product range VP-Planner a $99 clone of Lotus 1-2-3.

In Australia, Micro Data Management Systems has picked up the distributorship for a range of dBase clone products, all selling for less than Ashton-Tate's prices and/or claiming vastly improved performance and features.

MDMS has dBase-clone compilers for dBaseII and III; and a dBaseIII Plus-clone is expected in June. Call (02) 745 1995 for pricing.

Creditors' delight?

The official liquidator for Computer Edge has called a meeting of creditors of the failed company following its recent victory in the High Court against Apple computers.

Computer Edge went into liquidation on March 28, 1985 with debts in excess of $390,000 and with the only assets being a $58,000 debt which is currently being paid off at the rate of $1,000 per month.

Brendan Marchesi, the officer manager with Bent and Cougle, said the meeting of creditors was being called to appoint a committee of inspection and

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to examine what future course of action is open to the creditors.

In *Computing Australia* last month Michael Suss, the managing director of the company said he was going to sue Apple for damages following his victory. "I will seek enormous damages" and "there will be punitive damages, unspecified damages, damages to my reputation and my company's reputation," he said.

According to Marchesi there is a chance the creditors of the company might be able to now get some money. "It could be assumed that if Suss has a case then Computer Edge could also have a case as it could be argued that the action Apple took against the company may have contributed to it going into liquidation," he said.

However he said that any money recovered would be used to firstly pay the taxation department the $30,000 it is owed, the staff wages which amount to $3,500 and Australian Guarantee Corporation, which holds a registered charge over the company's assets as a debenture holder and is owed in excess of $83,000.

John Le Fevre

Briefs

The desktop publishing market continues to grow, with new releases becoming frequent. One of the better known offerings is the Personal Publisher for the IBM PC and compatibles. It uses a Mac-like graphics interface and can be controlled by either mouse or cursor keys. Text and graphics can be mixed on the one page; text can be imported from word processing packages; and text can be made to 'flow around' pictures, even if the image overlaps more than one column. Prices start from $335. Call Software Corporation of Australia in Melbourne for more details . . .

Poor Person Software mentioned elsewhere in Newsprint this month by Guy Kewney now has an Australian distributor: Glyphic Software, PO Box 391 Pennant Hills 2120 . . .

This probably isn't the time to have a poke at awards (with our '86 PC awards imminent) but we must register our amazement and hilarity at an award given recently in the UK at the Which Computer Show. Demonstrating fervent patriotism the judges gave the System Innovation of the Year to ICL's One Per Desk. This wonder machine is sold in Australia by Telecom as the Computer-Phone. At last count Telecom had shifted a miserable 300 units since its launch well over twelve months ago. And this is the 'System Innovation of the Year'?

Back to news: inexpensive networking of PCs through serial ports is becoming more popular. A recent example of a product using this method is Multilink Advanced and Lanlink.

The former allows up to eight terminals to be attached to a single PC in a multi-user, multi-tasking environment; and the latter utilizes either 'star' or 'daisy-chaining' of micros into a network. Call (02) 419 5879 for more details.

Atari's salvo

Last month in Newsprint, *APC* predicted further jostling in the pricing of Atari's ST range and that of the Amiga.

It is occurring: just as this issue went to press (May 16) Atari's Australian distributor announced further reductions. The 520ST is now $300 cheaper — that's $800 off the original (March 19) official price of $2495 — and the 1040ST's monochrome monitor single disk drive system now comes in at $2195. Last month's review of the 1040ST contained Atari's then 'best' estimate of the machine's initial retail price at $3000. Interestingly, the 1Mb 1040ST's colour system now sells for the same amount as the 520ST did a month ago, and this is the same as the current price of the 512k Amiga. It's turning into a real tussle: don't forget that these are 'official' prices — what's happening out in the stores in terms of discounts and incentives is another matter.

So, will Commodore retaliate with a further cut on its Amiga? We think so.

Nomenclature

What would you have called the sequel to the Data General/One? The 'Data General/Two', perhaps?

Well, that was all too sensible for Data General. Instead, what we have is the 'Data General/One Model 2. The Data General/One Model 2 (DGOM2 for short(?)) comes with either an electroluminscent or an "improved" LCD display. By "improved" Data General doesn't mean "back-lit", which is unfortunate. A back-lit LCD is worlds apart from the traditional LCD which relies on ambient reflected light.

On the plus side though, the DGOM2's other features over its predecessor are an optional internal 10Mb hard disk, a couple of 'user usable' expansion slots, a parallel port, increased internal maximum RAM (to 640k), a video adaptor card and an inbuilt battery and battery charger on the LCD model. Prices start from $3600 (LCD screen) and $5600 (electroluminescent screen).

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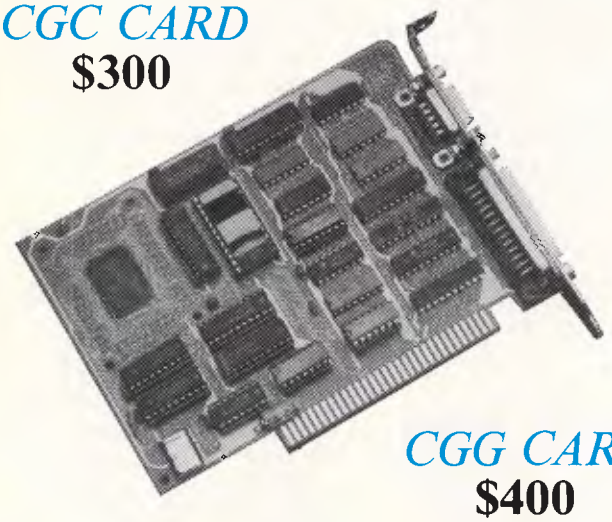

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BANKS' STATEMENT

Easy money

Never mind the money to be made in hardware sales — there's a fortune for the asking in optional, or necessary, extras. Martin Banks considers a golden future.

You've bin and gone an' dun it, ain't ya? Off you went and bought a 57-node networked PC system/Commodore 64 (delete whichever is inapplicable to the whims of your bank manager).

Now you've got it home and, being the clever little person that you are, you've even got it working; this qualifies you to be managing director of IBM at the very least. Having achieved this impossible task, you suddenly realise that something is wrong, something is missing. But what, you wonder with increasing frustration, can it be?

The penny drops: the operating system manual says quite clearly that you shouldn't use the distribution disk in your computer. Instead, it says you should make a copy and use that, so you look around your house and garage; you go to the garbage and search through the discarded boxes which the computer came in. Somewhere, you feel, there must be this 'blank disk' to which the manual refers.

After fruitless hours of searching you give up and, tail neatly deposited between legs, make your way wimpishly back down to the dealer from whence you came. 'Um,' you say by way of incisive opening, 'the blank disk thingie: I haven't got one.'

'Blank disks?' says a member of staff. 'Certainly.' On handing over a box of 10, the magic words are uttered: 'That will be $37.95, please.'

You have discovered one of the fundamental rules of computer ownership: the price doesn't stop when the purchasing cheque is cleared by the bank. The costs just seem to go on and on. What is more, the greater the number of functions you hope to perform with the machine, the greater the other costs are likely to be.

For the home-loving Commodore owner the questions of operating costs are probably fairly marginal. But for anyone, be it company or individual, who plans to use a computer for business purposes, these costs not only have to be taken into consideration, they have to be accounted for where it hurts most . . . the debit column.

This realisation came to me recently. Having existed, like many a journalist, on a borrowed this and a loaned that, I felt it was time I actually had one of these computer thingies for myself. To be fair to a couple of manufacturers of small, home-like computers, I already had some hardware lying around. None suited the purpose of being the business-oriented machine I needed, however.

With specifications studied and contents of wallet exhumed and brought to account, a choice was made and a deal done. The transportable PC-compatible from Italy (no, I refuse to tell you the make) duly arrived, as did a printer some days later. More dipping into the back pocket brought forth some word processing software and a box of blank disks, and there I was, ready to go.

Well, not exactly ready, after all. I looked at the printer and thought 'Ah.' It seemed an intelligent response to the situation at the time, though it didn't get me very far. Eventually I deduced that something was missing — paper.

Being a journalist, one receives all sorts of stuff through the post, and it happened that I had recently received a catalogue full of supplies for the 'compleat computerer'. 'Salvation is at hand,' thought I, and dived into its pages. 'I'll have a box of paper, some blank disks (better have lots of those, they're always useful), and some spare ribbons for the printer (so what if they only come in boxes of five — they'll always be useful).'

While I was at it, I noted down such essential bits and pieces as disk drive cleaners, screen and keyboard cleaners, and various other bits and pieces I thought might be necessary. Line by line, the list of things I needed to make my computer really do something useful was growing.

Bit by bit, it was also becoming more expensive. I sat down and totted things up. I realised with a certain sense of dismay that I was preparing to spend around 10 per cent of the purchase price of the computer on supplies which were essential to its operation. It was a factor I had previously never fully appreciated when using borrowed hardware, which in any case was often with me for review purposes only. The manufacturer would often say things like: '. . . and there's some paper and some blank disks,' and I would think no more about it.

Now, here I was, faced with the prospect of having to spend real money if this computer was to be anything more than an atmosphere for Flight Simulator. Not only was it costing me money, the prospect loomed of this expense being an ongoing scenario. Since then I have thought about a maintenance contract, and found that the cost is over 21 per cent pa of the purchase price.

What about all those people just getting into computers, especially those small to medium-sized companies who are at last becoming interested, now that networking is looking good? They are contemplating spending perhaps $25,000-$30,000 on 'the complete solution to your problems'.

What they may not realise is that they are also taking on a running cost of up to $9000 a year for the privilege. On balance, it shouldn't be considered that much for what you get, but it probably will be.

But if that sounds a lot, what about all those mega-corporations now planning networked systems in their mega-office blocks? The ongoing costs of maintenance and essential supplies must be staggering for some of these companies. It makes me think of companies like Kodak, the camera maker, which discovered the ultimate marketing trick. Having created a demand for photographs, Kodak then made the cameras cheap so that everyone would buy one. Then, all that people would need would be film . . . and film . . .

There could be gold in the hills of supplies. END

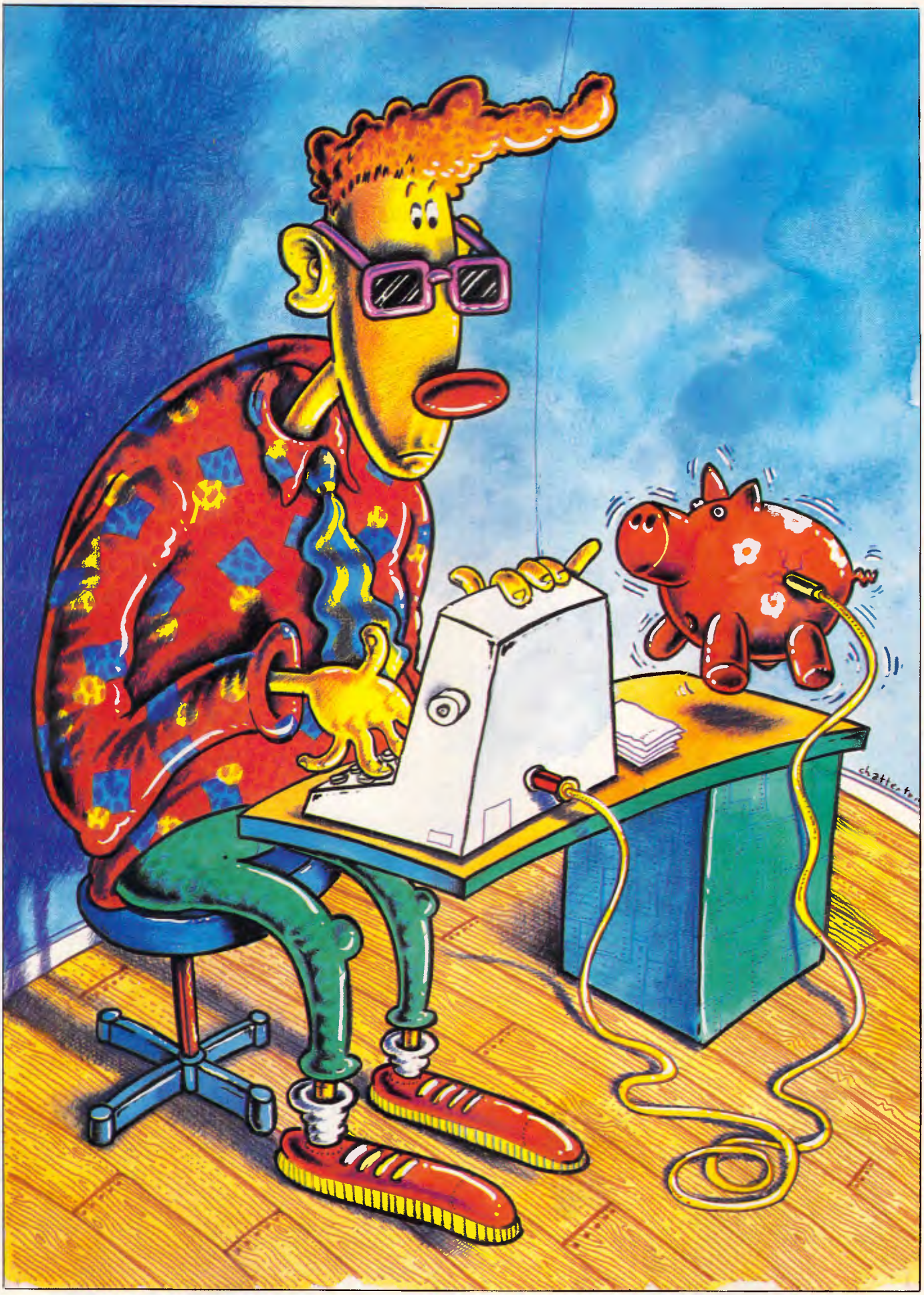
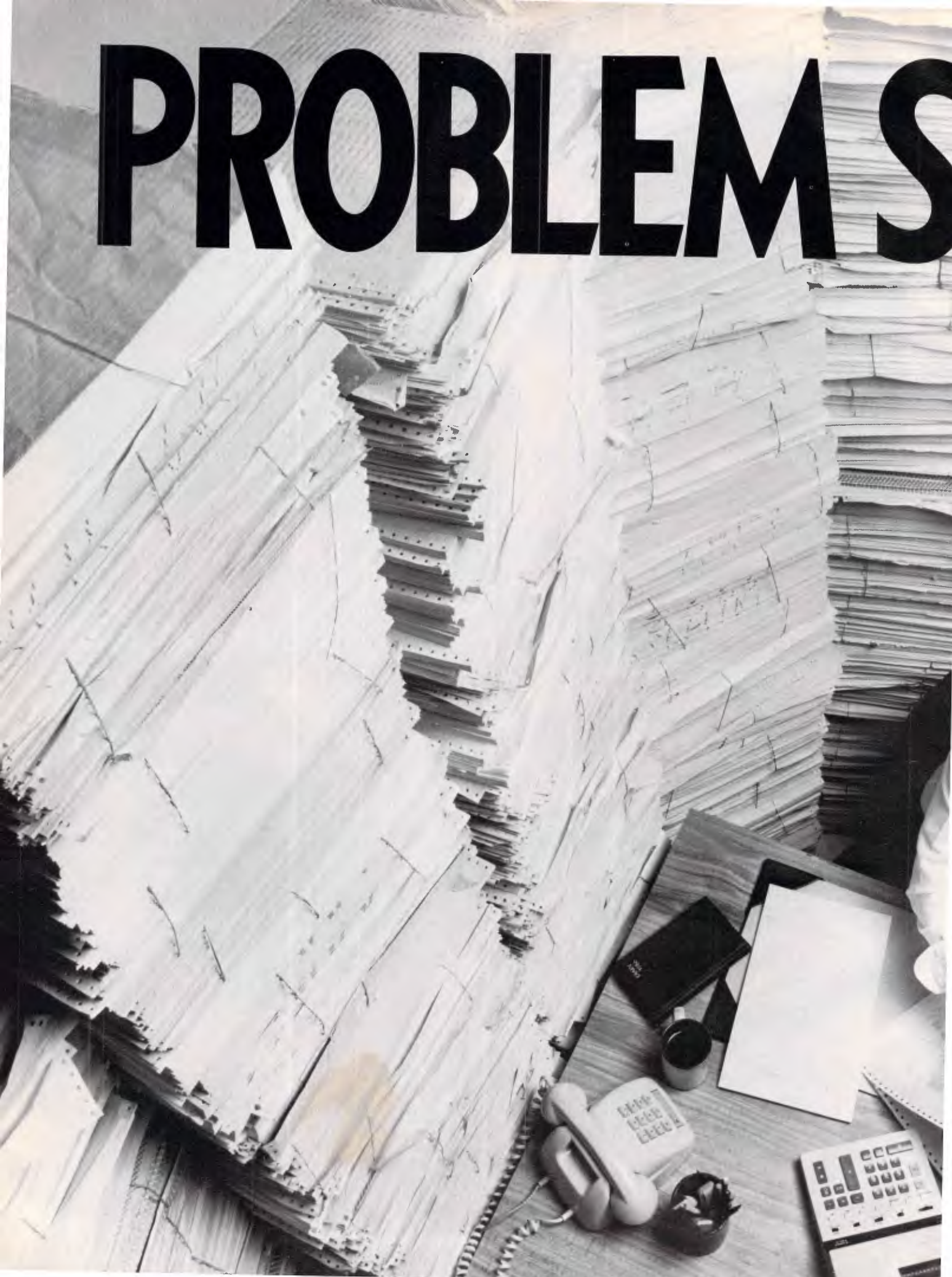
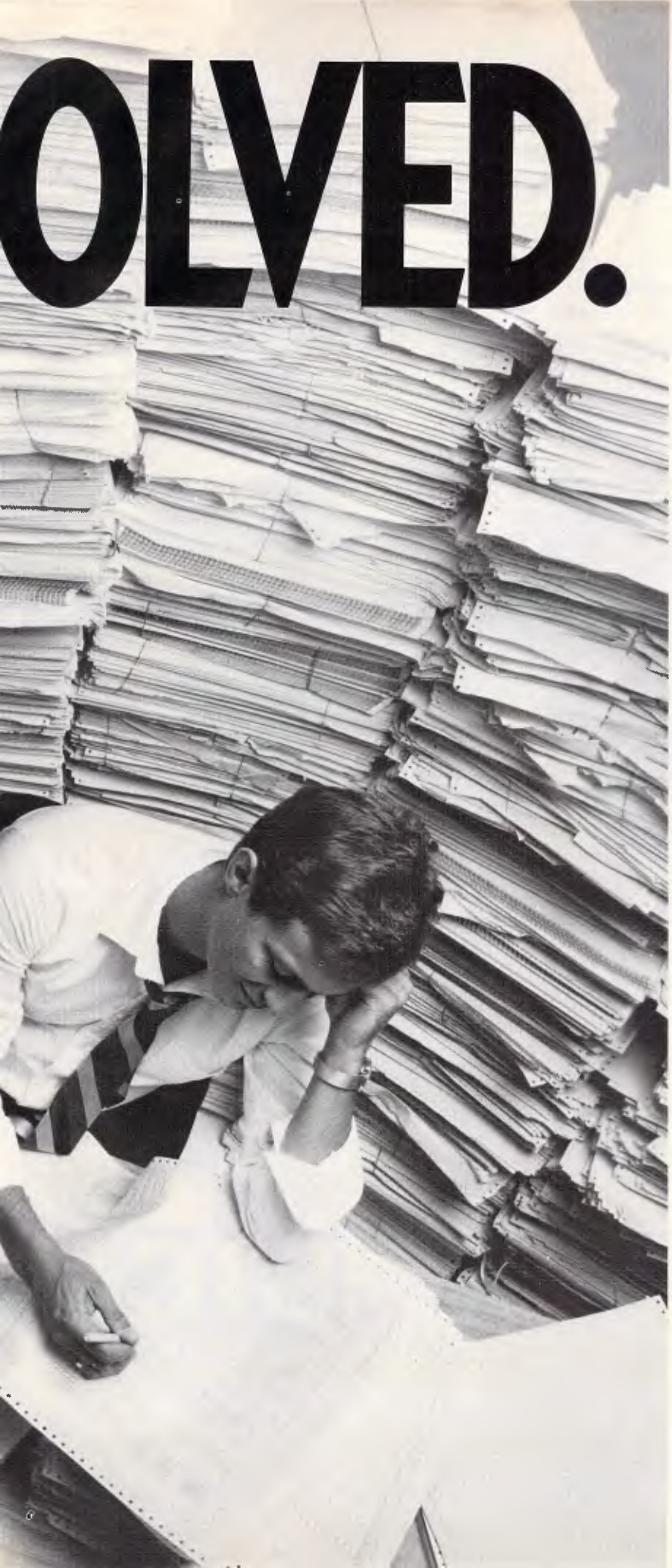


Illustration by Martin Chatterton

PROBLEMS





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BENCHTEST PREVIEW

IBM Convertible

The IBM Convertible is certain to cause a stir when it is launched in Australia later this year. Ray Miller takes the petite portable from the giant of the computer industry for a pre-launch spin.

Much has been written in the popular micro press about the IBM lapheld. Code-named the P14 and nicknamed the Clamshell, IBM is about to launch its latest personal computer. Indeed, by the time you read this, the machine will probably have been launched in the US, despite IBM failing to win a valuable ($US28 million) contract with the American Internal Revenue Service for 15,000 lap-helds. That contract was won by Zenith Corporation, with the Z-171.

Don't hold your breath waiting for IBM Australia to launch the machine, though, as it won't be available over here until much later in the year. Doubtless, a number of 'grey imports' will appear, but not through official IBM sources.

Convertible by name and by nature, IBM's lap-held PC incorporates many ingenious features, and is bound to raise more than a few eyebrows when it appears. Almost 100 years since the American Census of 1890 which saw the first IBM computer (of a sort), Hermann Hollerith, the founding father of IBM, would certainly raise his eyebrows if he were around today.

Hardware

The sturdy cream-coloured case measures approximately 48.3cms long by 7.6cms deep by 35.5cms wide. Weighing about the same as a small typewriter, the Convertible is a truly portable machine, which is more than can be said of the ill-fated IBM Portable PC. That machine failed because it offered no real advantages over the standard PC, and a number of disadvantages — specifically, you had to be within a few feet of a mains socket, and its expansion potential was limited.

With a rechargeable battery pack capable of powering the machine for 6-10 hours of normal use, the Convertible can be used almost anywhere — on the plane, in the train or in a car (with the optional cigarette lighter socket power

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lead). It can also be powered from the mains, and charged overnight with the same adaptor. The comparatively heavy nickel-cadmium batteries can be easily replaced by removing a cover at the back of the machine and sliding out the used battery.

Lifting the lid reveals the screen, the keyboard and the microdisk drives. The process of pulling the screen into position lifts the keyboard to a comfortable typing angle, and brings the front-mounted microdisk drives up from behind the keyboard — a very impressive bit of design!

Opening the box reveals a low-power CMOS processor — the 80C88 running at 4.77MHz (the same speed as the regular PC) and 256k of CMOS RAM, expandable to 640k. Along the rear edge of the machine is a parallel port, a serial port, an expansion bus and a power-supply socket for powering the machine and recharging the battery.

The Convertible features an 80-character by 25-line liquid crystal display (LCD) with dot-addressable graphics, as used in the Toshiba 1100 and many other portables. Fitting 2000 characters onto such a small screen has its drawbacks, as does the use of conventional liquid crystal technology.

Firstly, the characters are small and resemble the elongated, chubby characters which hallmark the Commodore Vic 20 screen; and secondly, the screen requires good lighting, as it does not feature a back-light like the Zenith portable. Depending upon your position relative to the screen, you will have to adjust the contrast; the control to do this is conveniently located at the bottom-right of the screen. Compared with other lap-helds, the Convertible's screen is surprisingly small (about half the size of the Date General One's), but is quite clear — once you have the correct angle and contrast.

One of the remarkable features of the Convertible is that when the machine is opened, you can remove the LCD screen and use a separate monitor for increased clarity when working at a desk for extended periods of time. This monitor comes complete with its own stand, and allows the Convertible to be used as a desk-based personal computer (*à la* Apple IIc).

Having come up to a comfortable typing angle, the Convertible's full-size keyboard is ready to use; and despite the overall small size of the computer, the keyboard is quite pleasant to use. The feel is better than many portable computer keyboards, but not as good as its bigger brother's. Above the main keyboard are the rather small function keys, and to the right of the keyboard are

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Games Port	Yes	No
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Monochrome Hercules Comparible Adaptor	Std. 720 × 348 1 × Parallel	Std. 720 × 348 1 × Parallel port
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Video Options	Colour/Graphic Mono/Colour	320 × 200 4 colours 640 × 400 4 colours
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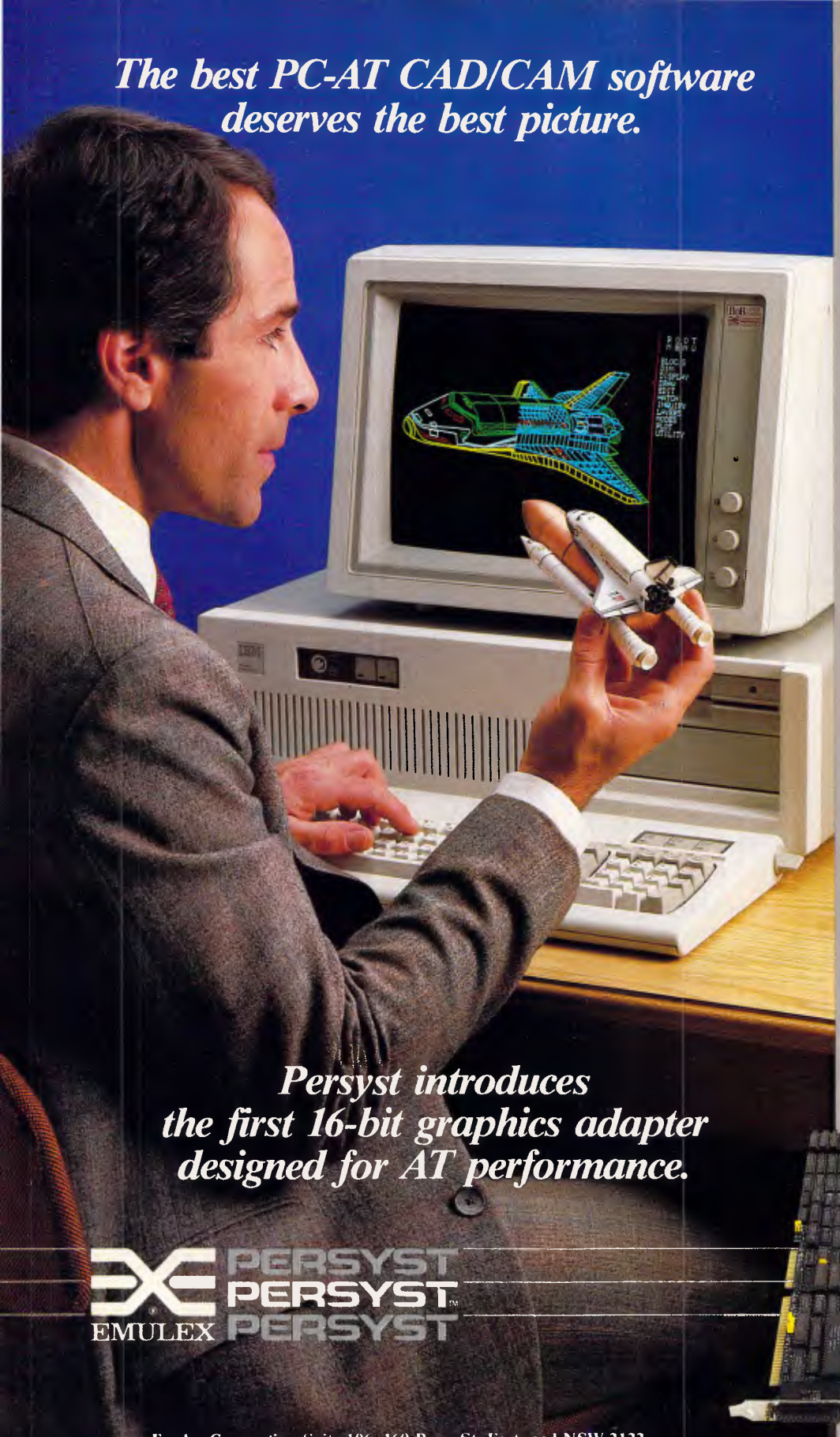
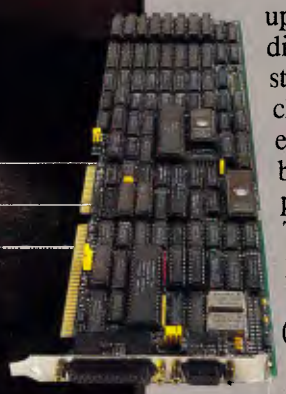


Persyst introduces the first 16-bit graphics adapter designed for AT performance.



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Persyst's new BoB/16™ Graphics Adapter is the first to give your AT both high resolution graphics *and* high resolution text. Also the industry's first graphics adapter that uses the AT 16-bit bus, BoB/16 provides twice-as-fast screen updating at twice the resolution—640x400. Plus the full spectrum of 16 pure colors with the ability to create up to 136 different hues.

Superb Graphics.

BoB/16 runs all the new top-of-the-line CAD/CAM packages—like AutoCAD, P-CAD and VersaCAD, as well as PC/Paintbrush and other popular graphics packages. And if you're not using CAD/CAM, BoB/16 gives you 640x400 graphic excellence for all the pace-setting business packages, too—like Lotus 1-2-3, Symphony and Framework.

Superlative Text.

Since BoB/16 is fully CGA compatible, you can run your existing graphics software and gain the benefit of twice-as-high resolution text with a 10x16 character cell. CGA compatibility also lets BoB run with the full range of operating systems—both PC-DOS and MS-DOS, and Xenix as well.

Super System Features.

System integrators will also appreciate BoB/16's downloadable characters—up to 256 simultaneously displayed with the standard IBM 256 characters. And other BoB extras like built-in bi-directional parallel printer and lightpen ports. To put the Persyst picture-perfect edge on your AT graphics—call (02) 858 4833

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The Convertible's separate printer is a miniature thermal transfer unit

separate cursor control keys which are also smaller than the alphanumeric keys.

Being so compact (it is designed to *really* fit into a briefcase, unlike many portables), there is no separate numeric keypad, although part of the main keyboard can be reassigned as a numeric keypad. For heavy numeric entry, this design may be sound, but for normal use I found it a little cumbersome.

The Convertible can be expanded internally from 256k to 640k, and there is room on the main circuit board for a modem. Similar to the Tandy 200, this feature will prove to be a necessity for many users such as journalists, salespeople and other professionals who either need to send information back to base, or conversely require up-to-the-minute information.

Further expansion is via the expansion port at the back of the machine, and one of the first peripherals to take advantage of this port is the Convertible's amazing printer. The printer is a miniature thermal transfer model, and, being the same height and width as the Convertible, clips neatly on the back of the machine. When it has been clipped into place, the printer extends the length of the machine by four inches, and can easily be carried with the computer wherever it goes.

Print speed is slow, at approximately 15 characters per second, but with a 24-dot print head, the quality is exceedingly good. Moreover, the Convertible's printer is just as happy printing text as it is printing graphics. Printing can be on normal paper using a tiny replaceable cartridge, or on special (that is, expensive) thermal paper.

Although not designed for heavy use, the cartridge should last for a while before needing replacement. Power from the rechargeable battery pack is drained quickly when using the printer and the microdisk drives, so the more you use these devices, the less computing time you will have.

When the Convertible is used with a full-size monitor, the portable printer can be placed to one side of the machine by means of a lead which runs between the expansion port and the printer.

The Convertible will work with any standard parallel printer, allowing you to keep the full-size monitor and a regular dot-matrix printer at the office, for example, while using the portable printer and the LCD screen while you are on the move.

Software

Although the Convertible is PC-compatible, it remains to be seen how much software (especially graphics programs) will run on the machine. More important still is that the disk is of a completely different format from the PC, so existing software will not run as is.

Despite that limitation, files can be transferred from full-size PCs, using an add-on 3.5in microdisk drive. In time, we may see add-on 5.25in disk drives for the Convertible, although perhaps not from IBM.

The review machine came with PC-DOS 3.2, the latest version of DOS, which is designed for use with the new 720k, 3.5in microdisk drives. Also bundled with the machine was an Application Selector program, allowing programs to be selected by simply

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The LCD screen is detachable; a 9in IBM monochrome display turns the Convertible into a desk-top system

pressing a function button which is assigned to the program you wish to run.

Icons representing disks and tools are shown onscreen, and the Applications Selector is easy to use. Different tools allow you to set the time, date, communication speed and defaults for the power-up and power-down procedures: the Convertible switches off automatically after use, and the length of time may be set from one minute to two and a quarter hours.

Don't worry about losing data, though, as the machine goes into a state of suspended animation — and when you switch on again, it continues exactly from where it left off. At the time of writing, there is little applications software available, although IBM's own PC programs and best-selling packages such as dBaseIII, Lotus 1-2-3 and WordStar 2000 should be available shortly. The PC add-on which will allow files to be transferred from 5.25in format to 3.5in format will allow you to copy files which you have been using at the office onto microdisks for use on the move/at home, or *vice versa*.

Technical specifications

Processor:	Intel 80C88 operating at 4.77MHz
ROM:	64k
RAM:	256k, expandable to 640k
Mass storage:	Two 3.5in microdisk drives, 720k each
Keyboard:	Standard pitch with numeric keypad overlay
Size:	35.5cms x 7.6cms x 48.3cms
I/O:	Serial, parallel, expansion port
DOS:	PC-DOS version 3.2
Bundled software:	Application Selector

In perspective

John Fairfax and Sons has equipped some of its journalists with portable PCs and modems for sending stories back to its electronic compositing system. The American Internal Revenue Service has equipped some 15,000 employees with Zenith Portable Computers. Clearly, there is a demand for lap-held computers such as the IBM Convertible; just how big the market is, remains to be seen.

However, there is certainly no shortage of machines aimed at the user who needs an electronic office while he is on the move. In launching its lap-held PC, IBM is giving the Big Blue Seal of Approval to this area of the market-place. It is also giving a Seal of Approval to the 3.5in microdisk format, introduced by Sony. In changing format, IBM has doubled the capacity of its disk drives from 360k to 720k. Given the advantages of this format over 5.25in disks (small size, protective plastic jacket, and so on), we will doubtless see more machines using this size.

Now, we can expect to see hordes of third-party manufacturers gearing up to produce clones and accessories in no time at all. I wonder who'll be the first to produce a matching clip-on radio modem . . .

Price

Starting at approximately $US2500, the Convertible is fairly well-priced, although it remains to be seen how much it will cost in Australia when it eventually arrives on our shores. Prices for options are unavailable at the time of this preview.

Conclusion

A lot of thought has gone into the design of this wonderful little machine. From the clever mechanics which lift the keyboard when the screen is raised to the 'plug-in' design of the peripherals, the Convertible represents the state of the art in affordable, practical, portable PC-compatibles.

A full Benchtest of the Australian version of the Convertible will appear in *APC* when it is launched in Australia. That launch is expected to be later this year.

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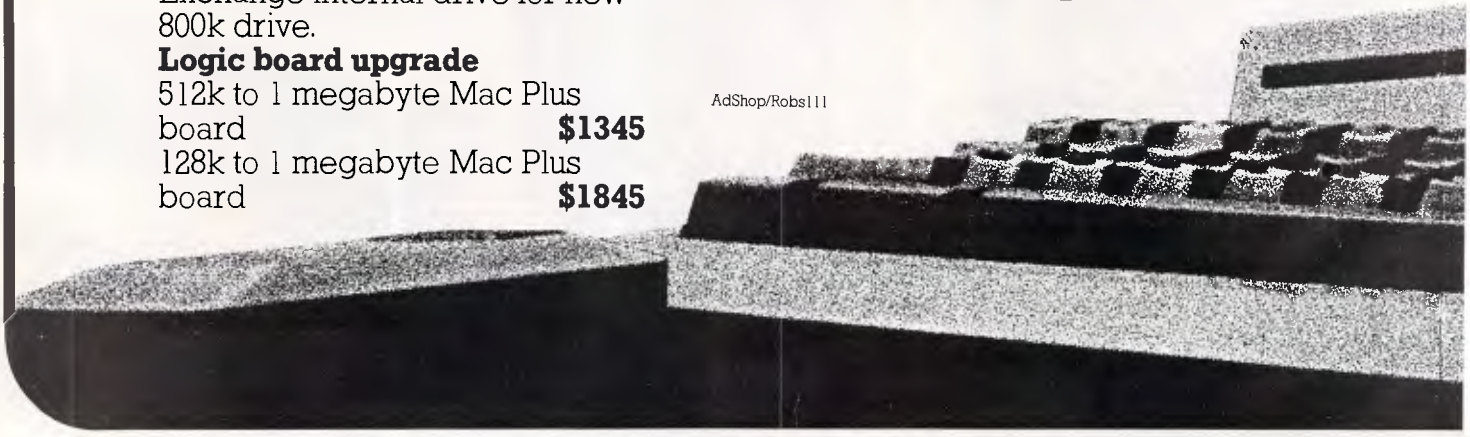

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Hard disk cards

Peter Jackson and Ian Davies examine three hard disk cards for the IBM PC and compatibles — the Hardcard, the FileCard and the Drivecard, which are all examples of an obvious but long-awaited idea: the provision of hard disk capabilities in machines with floppies only.

When Plus Development showed off its Hardcard plug-in disk board for the IBM PC last winter, it suddenly seemed such an obvious idea that the only wonder was how long it had taken for someone to build it. The pieces of the puzzle had been there all along; Winchester disk controller cards could already fit into half-length IBM slots, while half-height and third-height 3½in Winchester drives were already being built into various machines. All that was needed was for someone to notice that a 3½in Winchester was smaller in diameter than the standard 4in height of an IBM card, and the rest was merely engineering.

A hard disk controller card could be built using all the latest single-chip techniques, including custom integrated circuits and surface-mounting technology, to squash the controller down to one end of a standard 13in IBM plug-in board. That would leave room to bolt a metal-cased, shock-mounted, half-height Winchester, like those being used in the new breed of portables, to the other end of the board. Plus Development got there first, and launched its 10Mbyte Hardcard in July last year.

In science there is something called the Eureka effect, where everyone in the field suddenly recognises an idea that has simplicity, elegance, and an indisputable air of correctness. Or, to put it another way, one instinctively knows when something is right. Hard disk makers were certainly shouting 'Eureka!' as they quickly announced instant competition for Plus' Hardcard, with higher capacities than Plus' 10Mbytes, and various add-on functions such as additional RAM, I/O ports, and realtime clocks.

There were around five such boards on view at the Comdex trade show in the US last November, and there are now something like a dozen on the market from the expected hard disk names and some unexpected new names, too. It seems like a good time, as these drives start to appear in Australia, to examine three typical examples of the species: Plus Development's original Hardcard, Western Digital's FileCard and the Drivecard by Mountain.

Where they come from

Plus Development itself is not such a new name as it seemed last summer. Its parent company is California-based Quantum, a well-known designer and manufacturer of big, hard disk drives and controllers for the OEM market — that is, other companies buy bare drives and controllers from Quantum and build them into their own systems. Quantum could see opportunities in the micro market for retail storage products, and set up Plus Development to explore that business without making its big OEM customers nervous.

The work on the Hardcard design took over a year and a half, in conjunction with a manufacturing subsidiary of the giant Japanese corporation Matsushita, which actually puts the boards together.

Western Digital, based in Irvine, California, has a similar but different background. The company has been designing disk controller boards and chips for a decade and more, first for minicomputers, then for early $100 micros, and then for PC-style single-board computers. Its single-chip Winchester controllers are used in disk add-ons and add-ins from numerous other manufacturers, and perhaps it was this that prompted the company — like Intel before it — to set up an Enhanced Peripherals Division to market finished products to the retail market. Prime place in the list of three new launches last November went to the FileCard, a 10Mbyte drive on a single IBM card with a compact controller built around Western Digital's own custom controller chips.

The third card comes from the relative newcomer, Mountain, who are based in California, and is called the Drivecard.

Best of the rest

In the US, other boards available include the 20Mbyte DiskCard from top hard-disk maker Tandon, and the 10Mbyte Dinasti from the well known JVC. In the UK, Plus 5 Engineering has launched the PlusCard and XTech has started shipping its Insider. And just to prove that the market is beginning to reach some kind of maturity, it got its first lawsuit at the end of February this year. Quantum, parent company of originator Plus Development, is suing Mountain Computer and any other plug-in Winchester maker using drives from NEC in Japan. Quantum alleges that the NEC drives infringe its patents, although both Mountain and NEC are strenuously defending the case.

First a lawsuit, and now the first official price cuts in the face of competition are under way. The plug-in Winchester business is obviously in a healthy condition.

Hardcard

Plus Development's Hardcard has all the benefits of being first in the market, but it has all the drawbacks, too. The board was designed to be simple to install, simple to use, and usable in every IBM PC on the market, including those where a hard disk was already installed.

By aiming at all PCs, including those benighted machines with the old ROMs, cassette port, 64k motherboards and weedy power supplies, Plus could sell to upwards of three million PC and XT owners. But supporting the old machines means that the power consumption had to be kept down, and that the board had to fit in any long slot at all, keeping the capacity of the board's Winchester drive down to 10Mbytes for the foreseeable future.

'In science there is something called the Eureka effect, where everyone in the field suddenly recognises an idea that has simplicity, elegance, and an air of correctness.'

Opening the smartly-designed packaging, done out in Mothercare-style pastel blue, pink and green, reveals the result. The board, weighing around 1kg (2.1lb), has a slim metal enclosure covering the 3½in Winchester drive at the non-connector end, while the controller electronics are exposed above the bus connector. A glance at the electronics shows the work that has gone into keeping down power consumption and size; the board is tightly packed with big, surface-mounted, very-large-scale-integration chips in their distinctive square packages, and most of the chip type numbers, including the custom logic circuits, contain the telltale 'C', showing that the chips use low-power-consumption CMOS technology. There are signs, though, that the controller hardware is still being developed; the board layout of the current model is certainly different from the original prototypes, and there is still an extraneous transistor soldered onto the back of the board to put right some small glitch.

Apart from the board, the box contains only a plastic card guide (if required), along with one slender manual.

Installing the board is as simple as installing an IBM PC expansion board ever is. After sliding off the system unit cover and removing one of the metal slot panels at the rear, the board simply slides into the board guides and into the PC's bus connector. The Plus manual flatly states that users should remove any existing board guide at the front of the machine and replace it with the one supplied with the board, but I had no problems with the guide that was already in place. Presumably, Plus wants to make sure that the board is firmly held in the guides to cut down any vibration when the drive is spinning, but the guide in my machine seemed tight enough. On the other hand, the manual's instructions to screw the board firmly into the metal frame at the back of the machine are just good sense.

That is the entire hardware installation procedure, and was no more difficult than my experience of installing a 256k RAM board in the same machine. There is no need to change the DIP switch settings on the PC, and the only possible hardware change the user can make is to alter a 'jumper' on the Hardcard itself. The jumper is set at the factory, assuming that the Hardcard is going to be the first hard disk drive in the system, but if it is going to be the second hard drive — in an XT, for example — the jumper position needs changing. This is a simple task, too, since the jumper positions are straightforwardly labelled 'PC' and 'XT'.

Powering up the re-assembled PC with the usual PC-DOS or MS-DOS system disk in floppy drive A brings up the usual prompt, and the real installation of the Hardcard, the software installation, can begin.

The drive on the board is already formatted at the factory, and also has an Install program ready-stored on it. Typing C:INSTALL C at the A prompt starts the installation program running if the Hardcard is the only hard disk drive in the system, while if the jumper has been changed for an XT system, the Hardcard is drive D and the instruction is D:INSTALL D.

Either way, the Install program takes control of the system and goes step by step through a 10-minute installation procedure. This involves putting the system tracks and all the normal PC-DOS or MS-DOS utilities on the Hardcard. You also need a blank floppy during this procedure, as the Install program creates a 're-install' disk that can be used for setting up the Hardcard from scratch in case of error or glitch. Re-install deletes all the data files, though, so backing up

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these files should be done at the slightest provocation.

While the installation proceeds, you have the chance to notice one feature in the Hardcard's ready-installed software. One problem with plug-in hard cards for PCs is that there is no front panel indicator showing when the drive is active, and this can be helpful; for example, the machine can sometimes appear to have seized up during a long program compilation if it weren't for hard disk activity. Plus provides a program called 'Light' on the board's drive, which flashes a plus sign (+) at the top right-hand corner of the screen whenever a read or write operation is under way, at system level or inside an application. Another complementary program called 'Sound' beeps whenever a read or write operation takes place, which sounds appalling through the PC's speaker. Either or both of these features can be turned on or off at any time.

At the end of installation, all you have to do is leave the door of the A floppy drive open and press the Ctrl-Alt-Del key combination for an *ersatz* reset. Just like the XT, the system will boot from the Hardcard if there is no disk in drive A.

At boot-up, the Hardcard runs an autoexec batch file to bring up the Hardcard Directory (HCD) program, also provided on the disk. This lets you set up a menu-driven front-end for all the applications installed on the Hardcard, and has 16 possible menu items. Each numbered item has its own MS-DOS sub-directory, and if you intend to use the HCD structure, you need to copy all the necessary files for each application into its own sub-directory. Then the HCD program lets you create a macro, or a miniature set of batch commands, called by selecting a particular menu item.

For instance, if all the WordStar files are copied into sub-directory SUB1, associated with HCD menu item 1, then the macro you would enter would be CD\SUB1 <return> followed by WS<return>. Then the menu item name could be changed to WordStar, and after booting Hardcard, the program could be run simply by selecting that item.

Quitting any application called up from the HCD menu returns the user to that menu for another selection, and using HCD is about as friendly as using a menu ever is, which is not much. The software does have one disconcerting habit, though: it turns off the screen display after five minutes without use. Seeing the screen go dark from the corner of an eye, while half-waiting for the board to blow — thanks to heat problems — can add 10 years to your age.

I had no problems with the drive overheating, or overstraining the power supply, despite installing the Hardcard deliberately between the hot-running video board and the 256k RAM board in the Kaypro system. However, like most clones, the Kaypro PC's power supply is rated at XT levels to handle a hard disk rather than at the early PC levels for floppy use.

All that aside, there is nothing to show, when using the system, that the Winchester drive is on a card. The machine with the Hardcard acts just like an XT with twin floppies, as indeed it should if Plus has done its market research and hardware design properly.

The general impression is very favourable. The Hardcard really is simple to install and use, it really does go in any long PC slot — including one in the Compaq or the IBM portable — and it is unobtrusive. With the usual noisy PC fan you can't hear the drive at all, and must rely on the flashing plus sign for confirmation that the thing is running.

Plus has kept its original idea simple, elegant, useful — and tough. An inadvertent shock test involved dropping the board onto a carpeted floor from three feet, with a metal system unit casing instantly falling onto it from the same height. That was before installation, so unless the board was broken before and violent treatment fixed it, the Hardcard survived the test unscathed.

FileCard

Like Plus Development, Western Digital obviously called in a design house to do its packaging: this time, the colours are white, grey and light green. Inside, the contents are similar, too, comprising the FileCard board itself and two slim manuals.

The board is obviously similar in structure to the Hardcard, with the metal drive case at one end and the controller electronics and bus connection at the other. With FileCard, though, there are differences. The drive casing is thicker than Hardcard's, with its own mounting bracket at the end instead of a simple spline to slide into a card guide. The controller electronics are different, too, although they too make full use of VLSI, CMOS, custom circuits and surface-mounting technology. The controller, as you might expect from specialist Western Digital, is beautifully laid out and built, with no blatant kludges or late bolt-ons.

It looks more complex than the controller on the Hardcard, and there is one obvious reason for that in the shape of an extra connector at the bottom of the

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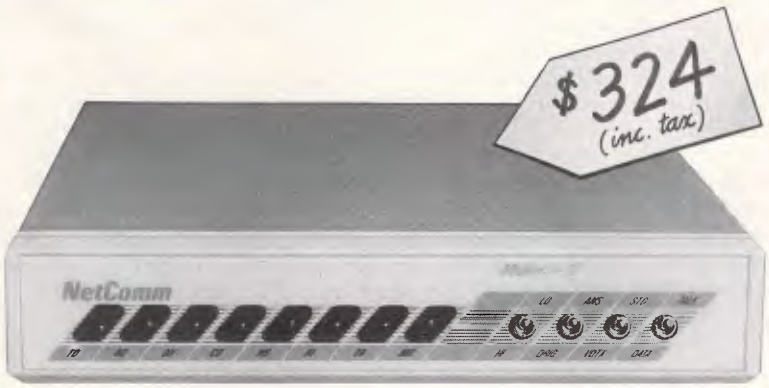

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card. This is meant to take a piggyback expansion board, and Western Digital has so far produced one containing up to 512k of add-on memory. Others are meant to be on the way, and would make it possible to combine a hard disk and a multifunction board in one card slot.

Installing the FileCard follows the same general lines as before, but Western Digital imposes some limitations on where the card can go. It can't go in slot one, where the speaker is, since the speaker would get in the way of the drive casing. And although a selling point is that the board takes up just one slot, that is true only in the basic PC (and even then, not in slot one). In the XT, with its greater number of slots slightly closer together, the FileCard takes up a slot and a half. This means that the drive casing overhangs the space that a next-door long card would need, and only a short card such as *the new Hercules colour card or* a RAM card could be used in that slot.

The FileCard's metal mounting bracket at the drive end of the board is designed specifically for the IBM PC, where the hole in the bracket matches up with a hole in the front panel, and the screw provided clamps the drive casing into the machine casing. On the Kaypro the bracket forces the removal of two card guides to install the board, and then there is no matching screw hole. A less-than-conspicuous appendix to the manual explains how to install the board using the card guides typically found in PC clones, but since the drive seemed to be working without guides or screw-fixing, and was jammed in pretty tight due to the crowded interior of the machine, it seemed easier to leave it.

One disturbing feature of the FileCard installation, apart from the usual dire warnings about CMOS circuits and human static electricity, was the fact that the drive's actuator and motor spindle were exposed through a hole in the back of the board — just where your fingers go when you are trying to wrestle the bulky board into its tight slot. There is a warning about this in the manual, stating that fingers should be kept out of the holes, but without giving any reasons for the holes to be there.

However, once again, that's all there is to the hardware installation, as long as the piggyback memory board is not fitted to the FileCard. Installing that board just involves plugging it onto the socket provided and screwing it down to the main disk controller portion, and it does not make the board any thicker. The expansion board was not available for this review.

The software installation followed the same route as for the Hardcard, but was not trouble-free. Installing the DOS floppy in drive A and booting as usual, then running the Install program provided on the FileCard by typing C:INSTALL, started the procedure in conventional style. The program copied over the DOS files and utilities needed on the FileCard's disk, and then, in a minimalist style typical of the software, said that it needed a blank disk in drive A, all the information on the disk would be destroyed, and did I want to continue. I typed Y for yes in answer to the last question, expecting a warning to remove the current disk and insert a blank. Instead, the program started to format my DOS disk.

Having produced another DOS back-up — for once I wasn't using the master copy — I tried again. This time all went well, until the machine hung up with the message: 'Installing DOS partition on the FileCard'. This was solved by rebooting the system with the re-install floppy in drive A; this re-formatted the hard disk and seemed to produce a FileCard working as it should.

'First the lawsuit, and now the first official price cuts in the face of competition are under way. The plug-in Winchester business is in a healthy condition.'

Perhaps this was a compatibility problem, but it seems unlikely as all the utilities needed for the installation are generic MS-DOS types rather than pure IBM PC-DOS types. Whatever the reason, the experience did not inspire confidence, although it seemed to end well.

As with the Plus Hardcard, the installation assumes that the FileCard is the first hard disk in the system unless it is told otherwise, and the appropriate jumper changes on the FileCard controller. The jumpers on the FileCard also allow the user to select settings for one FileCard, one internal hard disk and one FileCard, or no internal hard disk and two FileCards, in a system.

Instead of HCD, a program specially produced for Plus Development, Western Digital provides a free copy of the commercial XTree program on the board's disk. XTree, written by Executive Systems of Sherman Oaks in California, is a file-organising front-end for MS-DOS which keeps track of the chaos of files, directories, directories of directories, sub-directories of directories, sub-directories, and so on, *ad infinitum*, created by using MS-DOS.

In its series of onscreen windows, XTree shows the structure of directories and their sub-directories graphically, as a ThinkTank-like indented tree structure. The root directory is at the top of the graphic window, with the others sorted alphabetically and extending down as far as necessary. Instead of changing directories with the CD\<name> command in MS-DOS, it is done by moving the cursor to the appropriate directory name in the tree picture. The files in that directory then automatically appear in the Files window below the tree picture, and a program can be executed simply by placing the cursor on the program filename and typing X for execute.

The third window contains a set of statistics relating to the currently-selected directory, disk drive and file.

A wide range of DOS commands are available via the XTree menus and windows, and as with HCD, the idea is that programs can be selected from this front-end program, and quitting the application puts you back in the front-end just where you left it.

Apart from XTree, the FileCard acts just like an XT's hard disk, and although the noise of the drive was rather more obtrusive — the sound of the heads parking themselves in a safe landing zone, if the drive was idle, was a little disturbing at first — the drive acted reliably and easily. Western Digital claims that the power consumption of the board in use, complete with a 512k piggyback board, is an astonishingly low 6W. That is described as 'typical power usage', though, which probably means peaks pushing 10W when the drive motor is active and the heads are moving, and troughs down near zero when the drive is idle and the heads are parked. There was no way to measure the peak power consumption or the operating temperature, but the board did not get too finger-burning hot and there were no surprise glitches in performance.

The FileCard is a beautifully built and finished board that performs well once it is installed and formatted. The installation is tougher than with the Hardcard, thanks to the different support system and general bulk of the FileCard, but not more difficult than, say, a typical internal modem for the PC. The problems I had with the software installation caused me more worries, but eventually — and with bitten fingernails — I got it working. The installation software is rather too cryptic and leaves too much for the user to do, in my opinion, while not explaining what exactly is going on in words of one syllable.

Goto page 60

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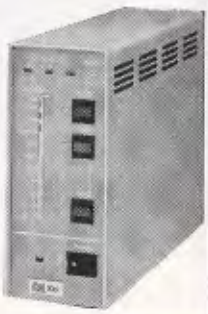

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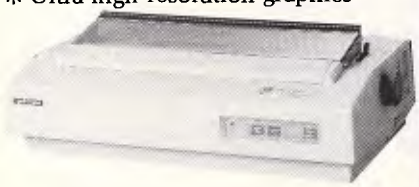

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SCREENTEST

Logistix

Aimed at simple project management, Logistix boasts an unusually wide range of graphics features combined with helpful data management functions. Kathy Lang puts you in the picture.

The spreadsheet market has for long been dominated by American products, notably 1-2-3 and SuperCalc, with Multiplan proving popular, too. Now Grafox, a British software house is out to change all that, with a 'spreadsheet plus' called Logistix.

Logistix takes the basic worksheet-based approach followed by its competitors; the worksheet can, theoretically, occupy a maximum of 2048 rows by 1024 columns, though — as is usual — the whole worksheet must be in memory. (There is, however, an option to establish links with other saved worksheets — more on this below.) The unusually large number of columns permitted reflects one of the special features of Logistix — its extra commands aimed at simple project management. When used for this purpose, each column becomes a time-slot, each row an element in a project; Logistix has a number of functions for handling such cells, including basic critical path analysis.

In addition to the time-based facilities and the usual range of spreadsheet functions, Logistix has an unusually wide range of graphics features — probably the best on the spreadsheet market — and some simple data management functions similar to those in Symphony.

When Logistix is first loaded, the screen shows a matrix of cells, with letters (A-Z, AA onwards) for columns and digits for rows. If you have a colour monitor, a variety of colours will be used to distinguish the cursor location, borders, headings, protected cells, and so on, with all colours modifiable by the user as part of the options available on the screen. These and other Logistix commands are invoked in a manner very similar to SuperCalc, by pressing the slash (/) key and then the first letter of the command. Help is available at any stage (through the F1 key on an IBM PC) and is carefully suited to the context in which help is requested. Fig 1 shows a typical Help screen.

Features

Logistix allows you to enter numbers, text or formulae into cells, to move, insert or delete rows or columns, and to copy individual cells, rows, columns or blocks; rows or columns may be copied into blocks of cells, and you can copy a row into a column or *vice versa.* Cell references are assumed to be relative if typed in lower case; and absolute, if entered in upper case. Recalculation can be in row or column order, or 'natural' order, which is the default; you can have automatic recalculation if you wish, though the default is manual recalculation. Individual cells can be protected from change. Logistix has a very wide range of functions, as Table 1 shows; few of its competitors offer as much, except perhaps in the financial field. Calculation features include a simple conditional processing function.

Logistix has a limited capacity for linking spreadsheets together; you can establish a link between individual cells in the current worksheet and spreadsheets stored on disk, a link which always uses absolute cell referencing, and which can be permanent or just operate once. Cells linked in this way are automatically protected.

If you want to view two parts of your spreadsheet simultaneously, you can split the screen into two windows, either vertically or horizontally. The cursor can be made to move in synchrony in the two windows. You can also choose to see call values in one window, and the formulae which created those values in the other.

Data can be saved from, or loaded into, Logistix worksheets using a variety of formats, enabling Logistix to read spreadsheets created by SuperCalc or 1-2-3 including their formulae, DIF format files and data files created by dBaseII.

Logistix includes a simple macro feature, allowing you to store sequences of instructions, and activate them automatically. In addition, serious system developers can buy a Programmers' Toolkit, which provides a much more extensive range of controls over Logistix facilities, including such features as the ability to create complete menus of activities.

Graphics

The graphics features of Logistix are extremely good. The types of graph available include a range of pie and bar charts, area and line graphs, as well as

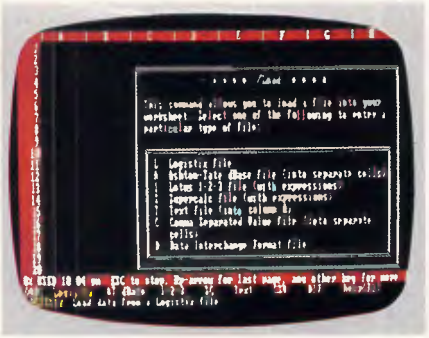

Fig 1 A typical Help screen

Fig 2 Pie chart, commands and data

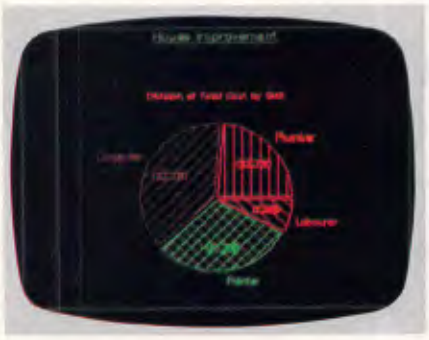

Fig 3 Pie chart screen view

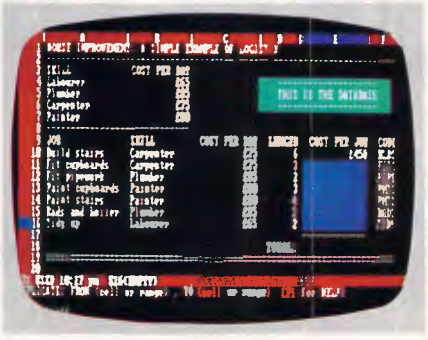

Fig 4 Database used in timesheet

Fig 5 Database after calculations

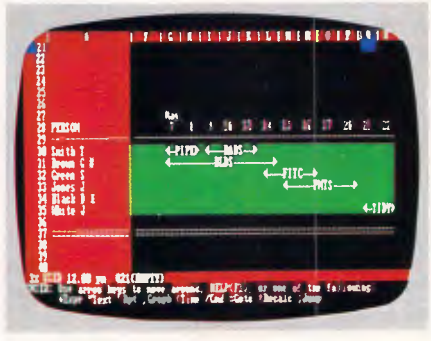

Fig 6 Timesheet . . .

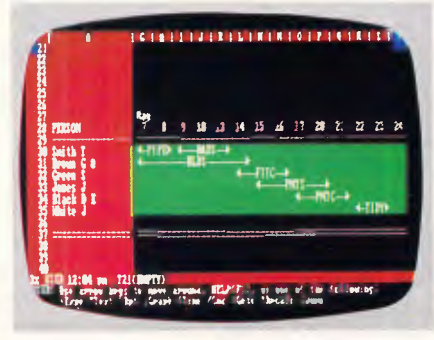

Fig 7 . . . task inserted, plan adjusted

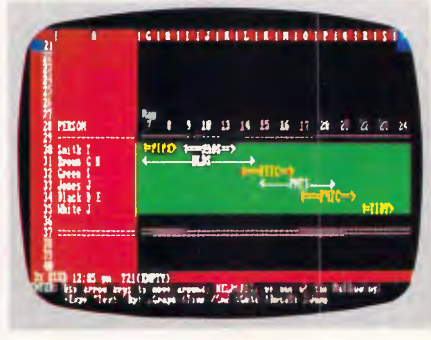

Fig 8 Critical path analysis

special types, such as Gantt and job charts, as part of the time management features. Options include a range of 10 line thicknesses and types, character fonts and sizes, types of hatching and special characters for points on line graphs.

Logistix also allows you to create text-only charts using this wide variety of features, making it possible to produce all the transparencies for a presentation through the one software package.

Graphs can be displayed on the screen, at present only through the standard IBM colour display, thus giving just four colours at the lowest resolution. But Logistix supports quite a wide variety of matrix printers and plotters, and up to 16 colours are available if your plotter permits. Fig 2 shows a simple set of figures which are graphed on the screen in Fig 3.

Data management

Logistix includes some simple commands which allow you to carry out simple data management functions within the worksheet. Up to 64 fields (columns) and 2047 records (rows) can be treated as a table; cells within the 'database' can be treated in exactly the same way as ordinary cells — indeed, they *are* ordinary cells, and do not need to be pre-specified as a 'database' except in the Query facility. Sorting can be carried out simply through a command. Queries can be set in a separate part of the worksheet to carry out quite sophisticated searches, including the use of wild codes, and the ability to combine several criteria in such a way that all, or only some, of them must be met. Once executed, you can use the results to find the selected records, or to copy them to another part of their worksheet. These facilities cannot be said to be comparable with those of even the simplest data management system of the 'automated card index' type, but they would be quite adequate for simple numerical tables needing basic sorting and query features.

Time management

The time dimension is the most unusual aspect of Logistix, and allows you to carry out simple project management and monitoring tasks. You begin by specifying the time units to be used — usually in terms of the half-hour, hour, day, week, month, quarter, half-year or year, although you can adapt the system to cope with other units. Then each task in the project is specified in terms of those units, giving a length of time for the task, showing the resource required (this dictates which row the task appears on), and specifying either the start point in absolute terms, or dictating this in terms of other projects using the 'After' function. There is no 'deadline' feature, so you cannot say that a project must be completed by a certain time.

Once the project details have been established, you can issue the Kritical *[sic]* command, to get a critical path analysis of your project. This will show the tasks whose completion on time is critical to achieving the currently projected completion date. The same command also allows you to see which tasks have some spare time — 'float' in project management terms — how much float there is, and when it occurs. Figs 4-

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8 show the sequence of creating a timesheet and the subsequent critical path analysis.

The Logistix time features are useful without being especially powerful by contrast with the specialist project management packages; for example, you can't specify a deadline by which all tasks must be completed, nor can you say that two tasks cannot take place simultaneously, but the order of carrying them out is irrelevant. However, you do get a range of functions sufficiently powerful for simple situations included in the basic worksheet approach. Not only does this save money — project

Mathematical functions

COS(*value*)	Cosine (*value* in degrees)
SIN(*value*)	Sine (*value* in degrees)
TAN(*value*)	Tangent (*value* in degrees)
COSH(*value*)	Hyperbolic cosine
SINH(*value*)	Hyperbolic sine
TANH(*value*)	Hyperbolic tangent
ACOS(*value*)	Inverse cosine
ASIN(*value*)	Inverse sine
ATAN(*value*)	Inverse tangent
DEG(*value*)	Degrees (*value* in radians)
RAD(*value*)	Radians (*value* in degrees)
PI	3.1415926536
ABS(*value*)	Absolute of *value*
INT(*value*)	Integer of *value*
ROUND (*value*, *n*)	Rounds *value* to *n* digits
E	2.718281828459
EXP(*value*)	e (2.718281828459) to power of *value*
LN(*value*)	Natural logarithm (base e) of *value*
LOG(*value*)	Common logarithm (base 10) of *value*
SQRT(*value*)	Square root of *value*
RAND	Random number between 0 and 1

Logical functions

TRUE	Returns 1
FALSE	Returns 0
AND(*values*)	1 if all *values* are non-zero, otherwise 0
OR(*values*)	1 if at least one *value* is non-zero, otherwise 0
NOT(*value*)	1 if *value* is 0, otherwise 0
IF(*cond-value*, *true-value*, *false-value*)	*true-value* if *cond-value* is non-zero, *false-value* if *cond-value* is zero
ERR	Returns ERR (error)
ISERR(*value*)	1 if *value* is ERR, otherwise 0
NA	Returns N/A (not available)
ISNA(*value*)	1 if *value* is N/A (not available), otherwise 0

Time functions

(up to 10 *jobnames*, or ANY, for each function)

START(*jobnames*,*row/range*)	Column of first occurrence of *job(s)*, on *row* or within *range*
END(*jobnames*,*row/range*)	Column of last occurrence of *job(s)*, on *row* or within *range*
LENGTH(*jobnames*,*row/range*)	Number of cells occupied by *job(s)*, on *row* or within *range*
AFTER(*jobnames*,*row/range*)	Column following latest end of *job(s)*, on *row* or within *range* (also the Critical Path Analysis link function)
FLOAT (*jobnames*,*row/range*)	Number of cells of 'float' for *job(s)*, on *row* or within *range* (applicable only to Critical Path Analysis)
JNAME(*cell*)	Name of job in *cell*

Calendar functions

(*column* must give a numeric value)

TOD(*column*)	Time (hours and minutes) of *column*
DAY(*column*)	Day of the month (numeric) of *column*
MONTH(*column*)	Month (alphabetic) of *column*
YEAR(*column*)	Year of *column*
DOM(*column*)	Day and month of *column*
DOMOY(*column*)	Day, month and year of *column*
MOY(*column*)	Month and year of *column*
DOW(*column*)	Day of the week (alphabetic) of *column*
MON(*column*)	Month of *column*
NWEEK(*column*)	Week number of *column*
NDAY(*column*)	Day number of *column*
DATE(*date*)	Column containing *date*
TIME(*date*,*time*)	Column containing *date* and *time*

Statistical functions

SUM(*values*)	Sum of numeric *values*
COUNT(*values*)	Number of numeric *values*
AVG(*values*)	Average of numeric *values*
MAX(*values*)	Maximum of numeric *values*
MIN(*values*)	Minimum of numeric *values*

Database functions

(*field* may be a field *offset* or a field *name*)

DSUM (*input*,*criterion*,*field*)	Sum of numeric values in *fields* of selected records
DCOUNT(*input*,*criterion*,*field*)	Number of numeric values in *fields* of selected records
DAVG(*input*,*criterion*,*field*)	Average of numeric values in *fields* of selected records
DMAX(*input*,*criterion*,*field*)	Maximum of numeric values in *fields* of selected records
DMIN(*input*,*criterion*,*field*)	Minimum of numeric values in *fields* of selected records

Financial functions

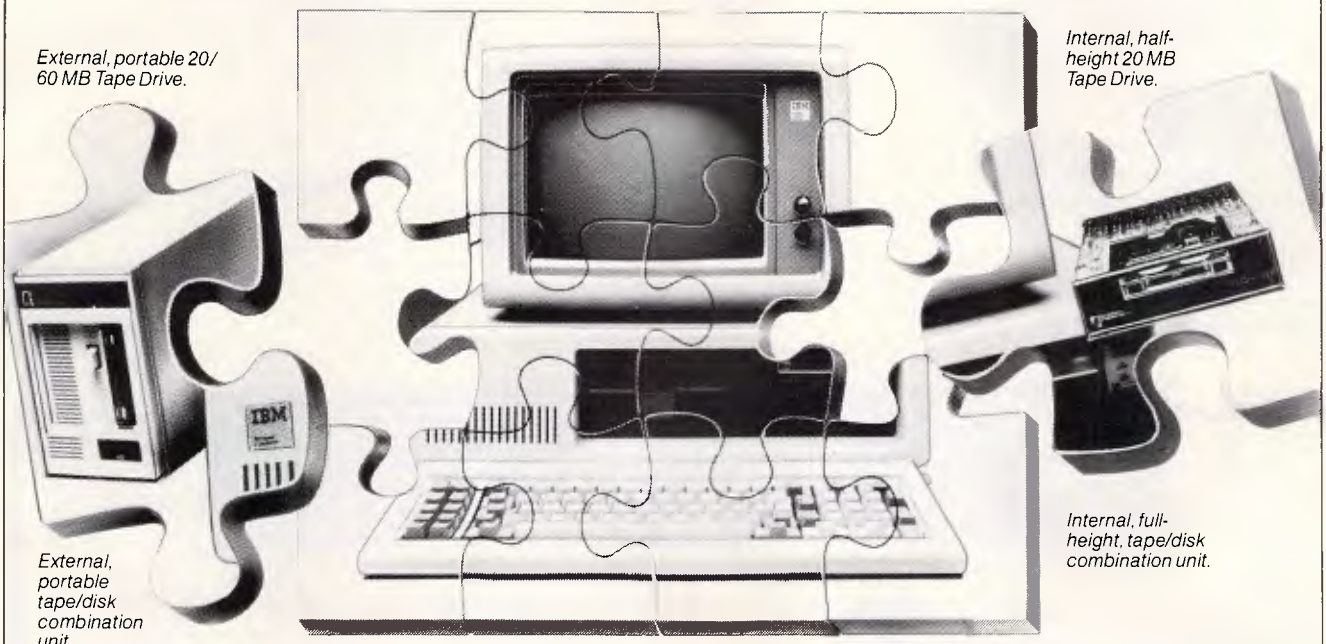
IRR(*guess*,*values*)	Internal rate of return
NPV(*rate*,*values*)	Net present value
FV(*payment*,*rate*,*term*)	Future value
PV(*payment*,*rate*,*term*)	Present value
PMT(*principal*,*rate*,*term*)	Mortgage payment

Special functions

COL	Number of *column*
NCOL(*column*)	Number of *column* (alphabetic)
ROW	Number of row
CHOOSE(*n*,*values*)	Returns *n*th *value*
LOOKUP(*value*,*range*)	Returns value adjacent to *value* in *range*
JDAY(*value*)	Julian day, month and year
JDATE(*date*)	Julian number of *date*
TODAY	Operating system date
TELTIM	Operating system time

Table 1 Logistix functions

TALLGRASS THE PERFECT FIT



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management packages are very expensive — you also have the opportunity to experiment with such techniques, using a simple approach which should come quite easily to people who already have some experience of using spreadsheets.

In use

The basic worksheet functions of Logistix are provided mainly through the slash commands, with the addition of a few function keys. If you have more than six function keys, you can use the rest to invoke your own macros. Most of the commands use the mnemonics you would expect: S for Save; I for Insert; and so on. I found the use of colour exceptionally helpful.

Options, such as screen colours and printer and plotter features, are also easy to set up, with one small exception; in order to set the plotter port speed or the number of data bits, for example, you must first issue a 'mode' command or its equivalent — you cannot do that part of the setting up through Logistix.

Resources

Logistix is available on quite a range of systems, including the IBM PC and most compatibles, the Apricot, the ICL PC, and several others. On an IBM PC, it needs 384k memory and, to get the best out of it, a graphics board and monitor. The package costs $795.

Logistix supports the 8087 maths co-processor, but not as yet any of the additional memory boards such as Intel's Above Board.

Conclusion

The range of functions provided by Logistix is unusually wide for what is basically a colour spreadsheet. At $795, it provides excellent value for money.

Logistix is available from South Pacific Computers, 417 Ferntree Gully Road, Mount Waverley, Vic 3149. (03) 543 4477.

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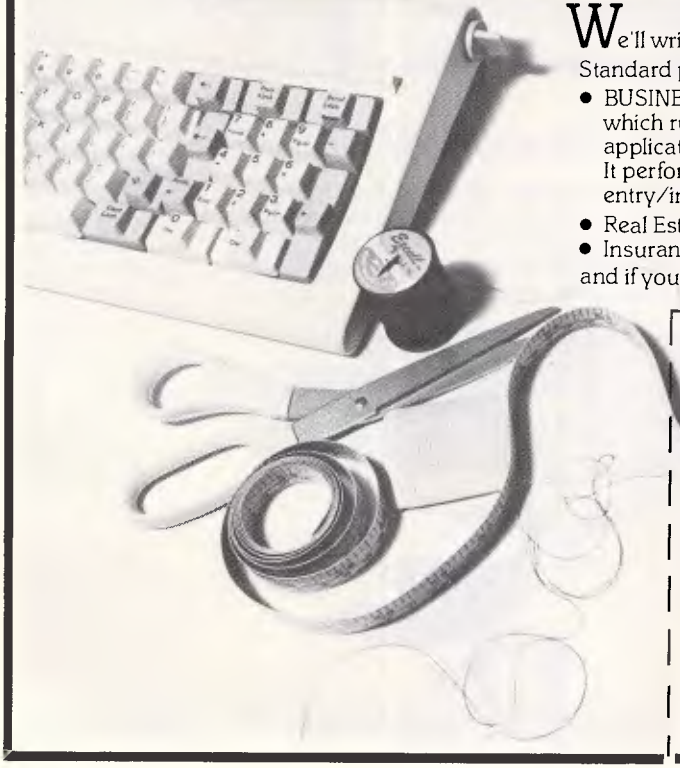

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YANKEE DOODLES

American users, discouraged by today's prices, are turning to a fast-growing alternative — bargain hunting. David Ahl sifts through the top US news stories.

Bargain hunting

An emerging trend, particularly among medium and small-size companies, is the purchasing of used, discontinued, and off-brand computers at bargain prices. Consider these recent offerings: a used $900 Apple IIc for $400; an IBM PC clone with 640k and an 8MHz CPU for $795; and a discontinued Tandy Model II for $500, compared to its original price of over $4000.

Bargain hunters can find used computers in many ways. Specialised flea markets and shows are one of the most popular; thousands of machines change hands at the huge Trenton Computer Festival in April every year. The *Computer Shopper*, a monthly tabloid, lists many hundreds of used and discontinued computers each issue. The Boston Computer Exchange is a computer broker with a file of over 1000 used computers and related hardware; it charges a seller 10 per cent of the sales price and sells its list to prospective buyers for $10. Several electronic bulletin boards and information services carry listings of used equipment, and local newspapers run many listings on their classified pages every day.

Most retailers shy away from used computers. They don't like the hassle of negotiating with buyers over the price, reconditioning the machines, and having buyers expect a warranty. But some retailers handle new computers obtained at close-out sales from defunct manufacturers. Recently, the Columbia PC (an IBM clone) has been showing up in retail shops for approximately $1200 — about half of its cost when its maker was still in business.

Community memory

The Community Memory system was first proposed by Lee Felsenstein, designer of the Sol-20 computer, back in 1978. However, as the dream of several people but the fulltime project of no-one, it took six long years to finally come into existence in Berkeley, California. Now, with a year of operation under its belt, the word is spreading, and other communities are expressing interest in setting up similar systems.

Community Memory is basically an easy-to-use electronic bulletin board with, at the moment, three terminals in high-traffic sites: a supermarket; a popular restaurant and community meeting place; and the Whole Earth Access Store (a 'hip' department store with a wide-ranging clientele).

When the system was set up, the organisers did not know whether they would have to provide 'helpers' at each site; whether the terminals would stand up to heavy use and abuse; and whether the system would become overloaded or, worse, not be used at all. But most of the problems anticipated by the organisers never materialised. People were able to use the system without supervision, and there has been no vandalism whatsoever. Every month, each terminal attracts about 600 users, and over 1000 new messages have been added to the database.

Messages on the system are incredibly diverse. Initially it contained mainly 'visible CB radio chatter', but this quickly changed to longer and more substantive messages. At any point in time, the system is now filled with about 3000 messages, ranging from ads to jokes to poetry to lonely heart pleas to nonsense. As might be expected from a system in which messages are not edited or censored, there is something to interest or offend almost everyone.

Back issues of the project newsletter and information about starting such a system are available for $US2 from The Community Memory Project, 2617 San Pablo Ave, Berkeley, CA 94702. Tell 'em David Ahl sent you!

Brainwaves

Researchers have been saying for years that the conventional Von Neumann computer architecture is eventually doomed. Speeds can perhaps be increased by another one or two orders of magnitude, but real improvements, say researchers, lie in a completely different architecture — parallel processing. Several experimental parallel machines have been built on university campuses, most notably Carnegie-Mellon, but now a host of smaller manufacturers have also started making such machines.

A conventional computer processes information sequentially, extracting one piece from memory and then returning it before going to work on the next piece. Parallel computers link together many microprocessors and have them all work at the same time. The machines which have been delivered so far use between eight and 48 processors. However, one under development by Thinking Machines, the Connection Machine, utilises 65,536 processors, and is attempting to become the fastest computer in the world.

But while parallel processing can make imaging and scientific calculations blindingly fast, the machines are extremely difficult to program. Moreover, there is no standard architecture, so customers are faced with dozens of different designs. As a result, some sceptics say that they will never be widely used. They are not particularly suitable for business applications such as managing payrolls or financial transactions (which, of course, must be done sequentially), and some computer scientists even doubt their value in scientific work.

Random bits

Those across-the-board IBM price cuts mentioned here last month are not reaching end-users; instead, most dealers are taking them as added profits . . . Steve Jobs has purchased the controlling interest in Pixar Inc, formerly a division of Lucasfilms, the company responsible for the Star Wars films. Jobs would not say whether Pixar's imaging technology would be incorporated into the high-end academic workstations which are being designed by his new company, Next Inc . . . Space Coast Systems is delivering a nifty 10 or 20Mbyte hard disk unit for the Apple II which fits neatly inside the machine; cost is $US1195 . . . The National Science Foundation will finance a fifth supercomputer research facility in the US at Carnegie-Mellon University . . . The prices of plug-in Winchester hard disks on a card for the IBM PC are likely to drop dramatically in the next year to the $US500 range. Such drives will largely replace the separate units on the market today . . . Texas Instruments will introduce a line of high-speed (40 pages/minute) laser printers later this year; prices will start at $US3000 . . . The new Apple II will use the Western Digital 65SC816 MPU, which is compatible with the 6502 in the Apple II and can emulate the 68000 of the Macintosh.

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Cont from page 44

Drivecard

The Drivecard, from the Californian based Mountain Computer, is the cheapest of all three. It seems to achieve its low price by the omission of bundled directory utilities, rather than by compromising quality. Despite the price, the Drivecard still manages to provide a capacity of 20Mb, formatted.

The card itself is one of the heaviest and the widest. The disk is enclosed in a moulded plastic cover on one end of the board, with the electronics largely on the other end. A bracket runs down the back of the component end of the board, as otherwise picking it up by the wrong end would surely snap the PCB. The circuitry is almost exlusively VLSI and customised chips. The layout is extremely well finished, with no tell-tale yellow wires.

While it is possible to see the stepper motor actuator and wheel, fingers can do little damage and it does make rather interesting viewing. Boot ROMs on the board means that your system can boot directly from the Drivecard.

Installation is the proverbial breeze, and involves lifting the lid, plugging in the card and closing it up. A spare mounting guide is provided just in case you happen to have lost one, and the disk comes preformatted for DOS 3.x. Thus for the latest DOS users, no software installation is required — simply turn the system back on and start filling up your new hard disk. DOS 2.x users need to reformat before use, as the DOS 3.x disk layout uses a totally different FAT (File Allocation Table) structure, utilising 16 bits per FAT entry rather than the usual 12 bits. This means that the FAT is larger, but the cluster size is smaller, thereby wasting less space on the end of every file.

A utility disk is provided, but does not include a directory manager or menu program. Instead, it contains an equivalent of the normal FDISK program, which allows you to define multiple partitions on the one hard disk. This can be useful for running multiple operating systems from the one device. Additionally, a SHIPDISK program is provided to park the disk heads.

The Drivecard can be installed either as hard disk number one or two, just by changing some jumper settings. Additionally, it is possible to use the controller on the Drivecard to run a second hard disk — which must be one of the approved varieties, but can be a standard XT drive. This is pretty neat, as it means you don't have to clutter up your expansion slots with multiple controllers.

The Drivecard plugs into a single slot, but because of its width, actually renders the slot next to it only useful for half sized cards. In IBM PC and XT machines, this can be countered by relocating the speaker and installing in slot one. In the M24 used to test the card, it seemed to encroach on the slot either side. Additionally, because the M24 16-bit slots have the 16-bit extensions on the opposite end to the 8-bit connectors, the board could only be mounted in one of the 8-bit slots. This was, of course, peculiar to the M24.

'...it suddenly seemed such an obvious idea that the only wonder was how long it had taken someone to build it.'

The Drivecard is certified to run on the IBM PC, XT, Compaq Deskpro, Portable and 286, and the AT&T 6300 (Olivetti M24); most PC-compatibles shouldn't present problems. The manual provides a section on how to remove the cover on each of these machines. It may seem like a strange thing to put in a manual, but taking the cover off really is the most difficult part of the installation.

Conclusion

The obvious market for all these hard disk boards is the large community of IBM PC owners, and owners of compatibles, who have previously been running their machines on floppies only. Most of these machines have no space to install an internal hard disk, and upgrading before these boards came along would have involved a bulky external Winchester box.

Now, as long as there is enough slot space, a hard disk can be plugged neatly into the internal bus, with no external sign that the machine has had its computing power boosted.

Choosing the right board from the many on offer depends on what type of capacity you want at what price. Of the three boards tested here, the Mountain Drivecard would be fine if you have lots of free slot space and don't need help managing your directories. It is also the one offering a 20Mb capacity. If you need RAM expansion as well, the FileCard would be the way to go. And if you want the smallest, neatest and narrowest package, then the Hardcard would be hard to beat.

One area where the Hardcard scores is in future upgrading. If you want to add another 10Mbytes, another Hardcard can be plugged in as long as you have any spare slot. Likewise, two FileCards can be plugged in, but here the space issue is a bigger problem, particularly with an XT or a crowded compatible. I tried the Hardcard plugged in alongside the FileCard, and that worked as long as the jumper on one of them was changed to show that it was the second hard disk in the system — I changed the Hardcard jumper since it was easier to understand which way it went — and the second drive was installed or re-installed as drive D.

The Drivecard not only can co-habitate with itself and other disk systems, but can also be a controller to a second hard drive.

Some doubt must remain as to whether an IBM PC of really old vintage, with the 65W power supply and the 64k maximum motherboard, could cope with the extra 10W peak load when one of these boards is plugged in. And even if it could, it would need a new BIOS ROM set to handle the hard disk.

But the hard disk board manufacturers assure me that it is reasonable to use their products on such long-toothed machines. And naturally, all compatibles worth mentioning have a beefed-up supply that can cope easily.

The general impression of the three boards on test is that they are simple to install, simple to use, and improve the performance of a typically-sluggish IBM PC clone to a marked degree.

Hardcard: $1795; Tech Pacific, Tel: (03) 690 9055.
Drivecard: $1645; Logo Computer Centre, Tel: (02) 819 7307.
FileCard: $1922; Daneva, Tel: (03) 598 5622. END

Technical specifications

	Hardcard	FileCard	Drivecard
Capacity	10.56Mbytes	10.7Mbytes	21.0Mbytes
Transfer rate	5Mbits/s	3.2Mbits/s	5Mbits/s
Average access	65ms	Not known	85ms
Power required	10.9W	6.08W	Not known
Size	13.4x4.2x1ins	13.4x4.1x1.1ins	13.8x5.0x1.7ins
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SCREENTEST

Which CAD?

There currently exists a number of micro-based computer-aided design (CAD) packages on the market which vary widely in their abilities and prices. Phil Cohen looks at Autocad and Prodesign II, two packages with different backgrounds and very different prices.

Until quite recently, the difference between buying a CAD package and buying any other piece of software was that you couldn't just buy the package — you had to buy a plotter or some other peripheral for it to drive.

This pushed the price of CAD up by several thousand dollars, and meant that before you even thought about a CAD package you first had to think very carefully about things like the maximum drawing size you were likely to need, how many colours of ink you would have to use, how fast you wanted the drawings produced, and so on. So buying a CAD package became a question of buying a CAD installation.

Now, however, partly due to the influence of machines like the Apple Macintosh, which allowed the user to draw diagrams and mix them with text, then print them on a dot-matrix printer, there is a growing trend to use CAD packages for diagrams, overhead slides, and a host of other things that the old CAD machines were not designed for.

"Prodesign II comes from the other end of the market, and does not have anywhere near the number of features that Autocad does."

There is now a slow convergence of technology, with the low-end Macintosh-like products taking on more and more functions to (hopefully), compete with the high-end expensive professional CAD products.

Autocad has been around for a long time (the two-dimensional version has been reviewed in June 1984 *APC*), and is something of an industry standard for micro-based CAD of the old type. It's designed to be a replacement for a mainframe CAD system, and will do almost everything that could be expected of a mainframe system, including drawing in three dimensions. It costs several thousand dollars.

Prodesign II comes from the other end of the market, and does not have anywhere near the number of features that Autocad does. However, it has enough features to allow it to be used for complex two-dimension drawings, and is designed to be used with a dot-matrix printer (with which it gives very good results — see Fig 1). It costs several hundred dollars.

Both packages run on the IBM PC and compatibles. This review used a compatible with a hard disk and a Hercules graphics card to compare the two packages, and is an attempt to show the differences between the two to allow a potential buyer to choose which type of

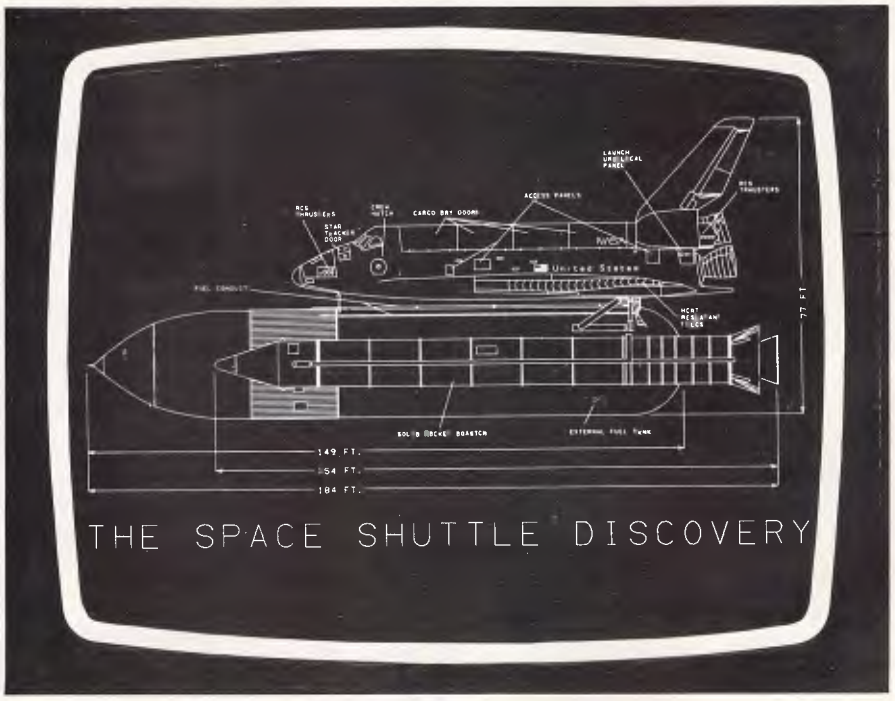

Fig 1: Screendump from Prodesign II using a dot matrix printer.

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package would best suit a particular application.

It would be foolish to spend several thousand dollars on Autocad if Prodesign II was all you needed. It would be similarly foolish to buy Prodesign II and try to use it for a task that only Autocad could handle.

Autocad

The version of Autocad reviewed was Autocad II with the ADE 3 addition, which costs $4300. It is possible to run Autocad on a floppy disk system, but with that sort of outlay (plus the price of a plotter), it would be foolish not spend the extra couple of thousand dollars on a hard disk.

The Autocad package holds a few surprises. The first is the manual, which looks like an expensive coffee-table book. The binding is what printers call 'perfect-bound', which means that it looks more like a hardback book than a manual. I suppose when you charge that sort of price for a package, you can afford up-market packaging.

Also, the product has been around for so long that it probably doesn't need the sort of documentation flexibility that a ring-bound manual would give.

The other surprise is that the whole Autocad suite of software comes on only five floppy disks. Other less weighty packages can include anything up to a dozen different floppies.

The software itself takes up only two disks, and the rest are for examples, drivers, etc. Autocad is written in the Lisp fifth-generation language, which comes as a bonus with the software.

Installation on a hard disk is simply a matter of copying all of the files across and answering a few questions about the types of peripherals to be used. After that, it is possible to run Autocad.

The first menu allows you to call up an existing drawing and edit it, or list the drawings on the disk, or start a new drawing.

Calling up an old drawing causes the screen to clear, and be split into three areas — the command area at the bottom of the screen, the menu area at the right of the screen, and the drawing area which takes up the rest of the screen.

By using the cursor control keys (the review machine was not fitted with a mouse or digitiser), it was possible to move a pair of cursor crosshairs around the drawing surface. The cursor movement is smooth and fast — a very important consideration in a CAD package, since the speed with which the operator can use the package can make a lot of difference to the installation's profitability.

Commands are entered in text form in the command area at the bottom of the screen. Prompts are displayed when appropriate, and help text is available for any command.

The command interpreter has the annoying habit of putting a prompt up for a particular keyword when you press the space bar at the end of the word. This means that you never actually get to type a line of commands.

"Autocad is written in the Lisp fifth-generation language, which comes as a bonus with the software."

There are approximately one hundred commands, and most of them need a specific sequence of inputs after the initial command word, so that learning Autocad is not a simple matter. I suspect that it would take a non-computer-literate draughtsman several weeks to get up to speed.

To make things a little easier, there is a menu area to the right of the screen where the user can select items with the cursor. Each item can be 'reprogrammed' by the user to a particular command string, and tree-structured menus can be built up. This means that after becoming proficient, the user can build up his or her own set of favourite commands, or even a different set for each drawing type (plumbing, office layout, electronics, etc).

Output from the package can be configured to suit any number of different plotters, or even dot matrix printers. The Epson FX80 is a common standard for cheaper dot matrix printers, and Autocad will drive it quite happily.

This may be useful for producing drafts of drawings in one colour, when a plotter is being shared by a number of different PCs, but I can't imagine anyone putting the cash and effort into becoming familiar with Autocad and then using it to drive a dot matrix printer.

Once you have a grasp of some of the keywords, using Autocad is quite easy and very fast. The package responds very quickly (especially to cursor movements), and everything is very smooth.

Apart from the usual tricks that CAD packages get up to, like multiple layers in the drawing which can be turned on and off or plotted in different colours, Autocad has a plethora of little tricks and depths to it that would take weeks to even explore.

To take one very small example, when asking for a particular area of the drawing to be 'hatched' (filled in with a line pattern), the number of different hatch patterns the user is presented with is enormous — and you can define you own as well.

Three-dimensional objects are defined very simply, by telling the package what height you want the object drawn at, and what thickness you want it to be. Changing the 'viewpoint' of the drawing allows you to see what you have drawn from a number of different angles, although the package will not support perspective views.

All objects drawn with CAD packages are defined as a series of lines in space, and normally all of these lines are visible all the time. This means that if you draw a desk and look at it from above, you will be able to see its feet. However, Autocad had a good 'hidden line removal' algorithm, which will make all of the lines which you would not be able to see in real life invisible when you ask it to.

Unfortunately, hidden line removal takes time, so it is unlikely to be used more than once, when the drawing is near completion. To speed things up, you could add an 8087 maths coprocessor to the PC.

Autocad is designed to be a 'production' CAD system, used every day by experts. It has a massive number of features, and learning Autocad is like learning a new computer language — not to be undertaken lightly.

Prodesign II

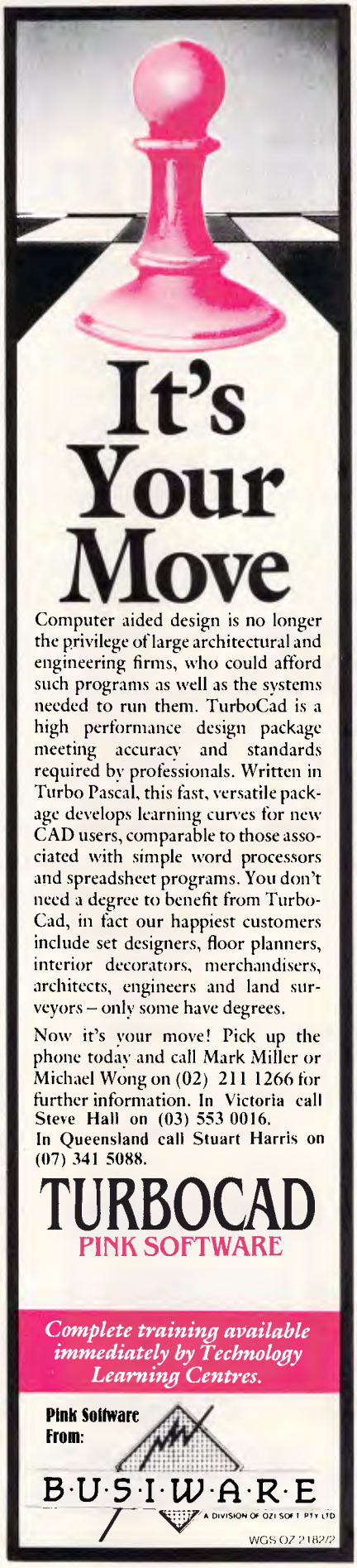
Prodesign II costs $485. No-one, not even the Australian distributor of Prodesign II (PD2), would claim that it was a successor to Autocad. It is aimed at a different part of the market, and although I may make comparisons between the products, that's just to show the differences that you should expect between packages from these two different ends of the market.

PD2 comes in a plastic library case which has a built-in ring binder to hold the documentation, and a little plastic-covered trapdoor in the back for the three disks.

One of the disks holds all of the software for the package, in a version for use without the 8087 maths coprocessor, while another holds the same software for use with the 8087. A third disk holds sample drawings.

The quality of the documentation is not very good. Not all of the information that you might need is included, and it's certainly not laid out in a useful way. Don't expect to start producing your first drawing in ten minutes.

Starting up the package is simple: once again mainly a matter of telling it



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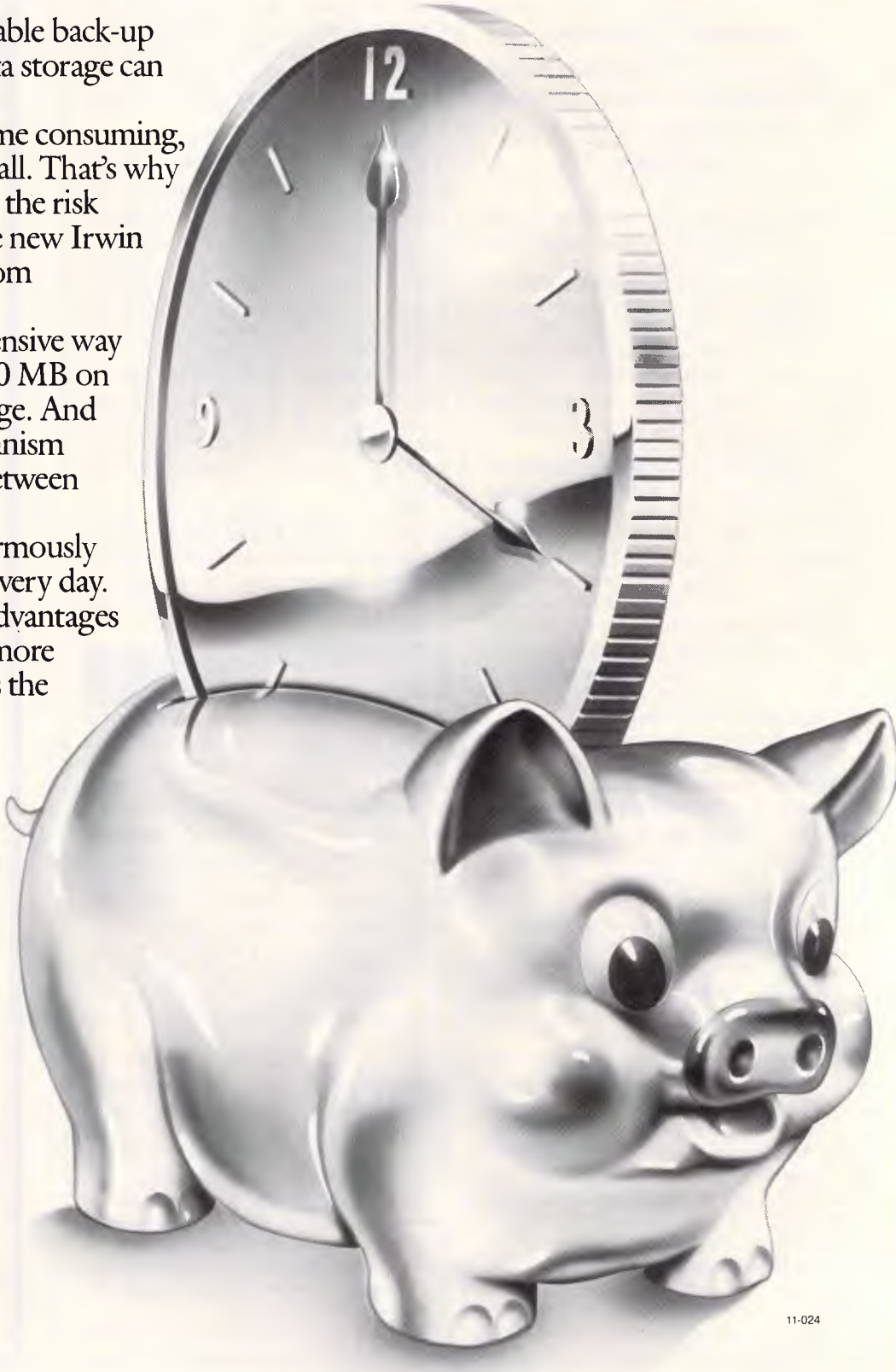

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what peripherals you want to use. PD2 will handle plotters, but its main claim to fame (and the way in which it is likely to be used a lot of the time), is in driving dot matrix printers, like the Epson FX80, or one of a large number of others.

Having got the package up and running, the next step is a difficult one. There is a status line across the top of the screen, a quick-reference guide and a manual that both present the commands in alphabetical order. Not a good way to start.

With much difficulty, I managed to get an existing drawing loaded and onto the screen. Actual screen refresh (redrawing on the screen), is not much slower than Autocad, which shows that the innards of the package are well written. However, cursor movement is very slow, and it is quite possible to fill up the keyboard buffer with cursor movement commands and overshoot.

"In general, there is not much you can't do with PD2 that you can do with Autocad — it just takes longer to do it."

This alone slows down the drawing process markedly. Perhaps if I had been using a mouse or digitiser, things might have been different.

I was pleasantly surprised, however, with the richness of commands provided by PD2 (when I finally figured out what they were and what they did). For example, things I expected to find only on Autocad, like fillets (nothing to do with fish — this means automatically making a semi-circle where two lines meet to show a rounded corner in a moulding) and chamfers (same as a fillet, but straight instead of round).

Text is well supported, with a choice of three typefaces. It is possible to draw text starting at one point, or to fit between two points, or using three points to give a slant (italics), or even using four points to give text that starts small and ends up large (for text that appears on a surface that slants away from you in a perspective drawing).

Where Autocad has an automatic step and repeat function (for drawing things like ladders, where an item is repeated every so often along a particular path), PD2 has a simpler approach, which involves copying part of the drawing as many times as you like in a number of different positions.

The zoom feature of PD2 is typical of the clumsiness found in all of the package's commands. To zoom in on a particular part of the drawing, you select the centre of the point you want to zoom in on, then type in a number which tells the machine the factor by which you want to zoom. What it does not allow you to do is define an area of the current drawing to zoom in on (as, I have to mention, Autocad does).

There are other possibilities with the zoom command, some of which can involve a combined rotation and zoom, but are slightly difficult to use and not very intuitive at all.

But all in all, PD2 is a powerful package for the price. It has a surprising wealth of features, including for example automatic drawing of dimensions, which I didn't expect to find. In general, there is not much you can't do with PD2 that you can do with Autocad — it just takes longer to do it. In terms of productivity for a professional draughtsman, the time saved by using Autocad would pay the extra $4000 in a matter of a few weeks, but with many applications a little loss of speed is not going to make all that much difference.

Summary

So put some thought into just what you are going to use a CAD package for before you buy one. Neither of these packages is particularly suited to producing overhead slides, by the way, mainly because they don't come with enough typefaces. There are other packages suited to that type of work.

As a rule of thumb, I would suggest that Autocad would be suitable to situations where one or more people spent much of their time doing nothing but producing drawings, while PD2 would be more suited to small engineering practices and other places where the occasional drawing is needed.

The review copy of Autocad was supplied by Logo Computer Centre, Suite 303, Henry Lawson Business Centre, Birken Head, Harbourside, Drummoyne, NSW 2047. Telephone (02) 819 7307.

Prodesign II is available from Software City, PO Box 62, Blacktown NSW 2148. Telephone (02) 621 4242.

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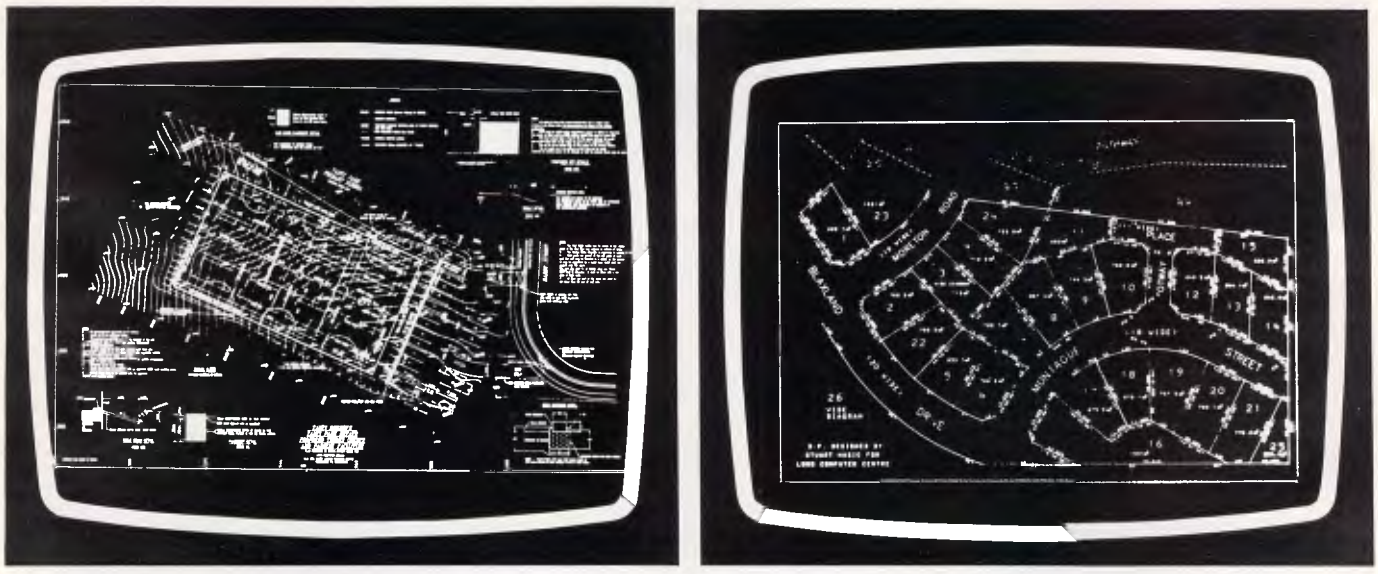


Fig 2: screendump from Autocad

Olivetti M19

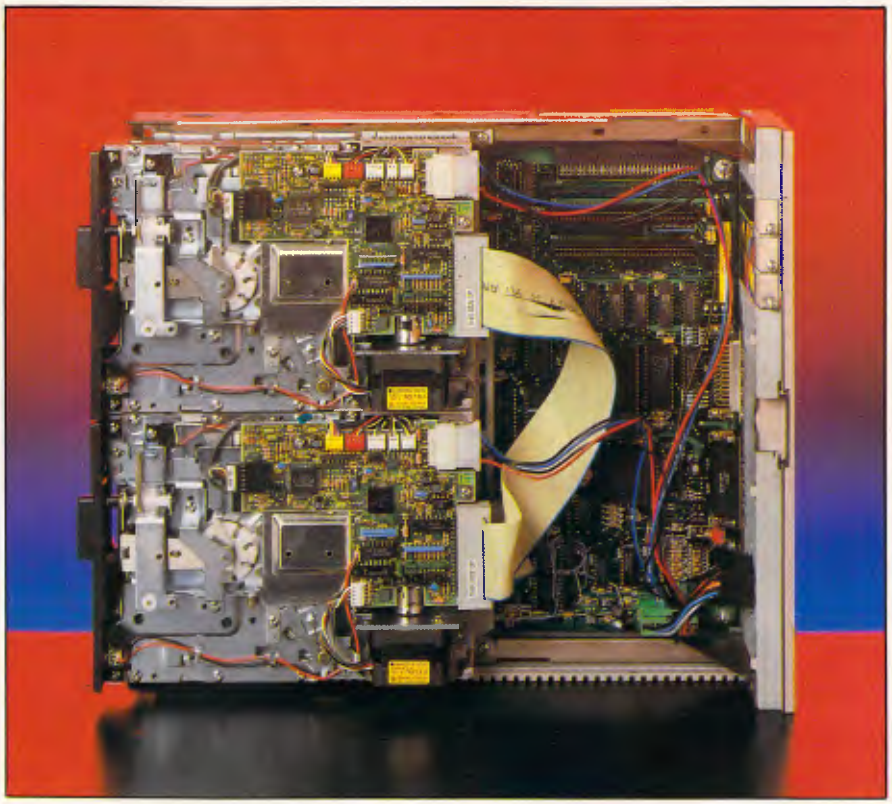
The M19 forms part of the Olivetti range of IBM-compatible micros. But, although the machine is guaranteed first-class support, it does have some worrying omissions. Nick Walker looks it over.

In 1984 Olivetti launched a new business microcomputer, the M24, its first IBM-compatible. While it may be a shame that Olivetti had to conform to the standard of one of its major rivals in order to make an impact on the market, the company certainly showed IBM how it should have been done. The M24 was one of the fastest, most compatible, best-designed compatibles available, and to this day it still remains one of my favourite choices as the best all-round PC-compatible.

Justifiably the M24 sold well and is now making inroads into the US after a couple of false starts. Following in the M24's tracks, Olivetti has launched not one but three machines, all IBM-compatible, to be added to the M24 to make a range of machines covering the whole spectrum of IBM-compatibles. These three new machines are the M19 entry level PC-compatible, the M22 laptop/portable model and the M28 PC/AT-compatible. As the M19 is the first of the three to make its way to our shores, I decided to take a look at it.

Hardware

At first sight the M19 doesn't look like an IBM clone at all. Although it conforms to



The main PCB is well built and occupies the entire base of the unit

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the classic three-box design, the M19 seems far too small and well designed to be in any way related to the monstrous heaps that IBM produces. The main unit is less than the height of an IBM floppy disk drive or, for that matter, the height of an IBM expansion card; the width is half that of the IBM PC and even its depth is less than the IBM's. To be exact, the main unit measures just 32.2cms wide by 38.2cms deep by 8.2cms high, which must surely make it the smallest, desk-top PC-compatible available. Needless to say, it looks very unobtrusive.

Like other Olivetti micros the M19 is finished in an office grey plastic and, as you might expect from an Italian company, it looks as though some thought has gone into the overall design. The overall effect is very pleasing, though to my mind the grey plastic is a bit too sombre to do the machine justice.

There is not much room on the front panel for any more than the two 5¼in disk drives which are mounted side by side. The inch of plastic that runs underneath the drives is vented and contains a badge on the left-hand side and a socket for connection of the keyboard to the right. There is no on/off switch on the front panel nor, for that matter, anywhere else on the main unit. The power for the whole system comes from the monitor and the single on/off switch is on the front of the monitor.

The sides of the machine are equally sparse, though if you look closely you'll find a reset on the right-hand side. This pleased me immensely, as more and more of the software I use seems to crash in such a manner that the usual software reset of Ctrl/Alt/Del keys pressed together fails to work. (The original IBM PC didn't have a reset switch and most compatibles have sheepishly followed suit). Next to the reset switch is a round hole in the casing into which you can screw a second piece of plastic to form a volume control. This, like the reset switch, is a useful little extra which is missing on the PC.

The rear panel houses the usual collection of IBM-compatible sockets. To the left there are three sockets in a row: an RGB socket for the monitor; a serial port; and a Centronics parallel printer port. Above this a multi-way power plug provides the power to the main unit — on the review machine this proved a little awkward to connect and looked as though it might be easily damaged. The RGB socket will drive both monochrome and colour Olivetti monitors or a standard RGB monitor, although additional hardware is needed to give power to the main system if anything other than the Olivetti monochrome monitor is used. A switch next to the RGB socket lets you select between monochrome and colour.

To the right of the ports there are covers for three expansion ports, but these are far too small to be suitable for standard IBM-compatible expansion cards. Unlike the majority of PC clones there is no fan to be found anywhere on the system. This is a sign of good engineering design from Olivetti, as the M19's closely-packed compact design doesn't even get warm. Thankfully, the absence of a fan also means that the unit is silent in operation.

Getting inside the M19 is very straightforward providing you *don't* follow the manual: a total of five, not four, screws need to be removed; two at the rear and three at the front. After removing the screws the cover slides forward an inch and is removed by lifting it at the rear.

The first thing that struck me was the total absence of a power supply — usually the most dominant component of a PC clone. All the power conversion is done within the monitor, so the power wires from the monitor lead directly to the PCB and disk drives.

With no power supply, the most dominant components by far are the two half-height disk drives which occupy over half of the casing towards the front of the machine. The review machine was supplied with two 5¼in, 360k IBM-compatible drives which were raised an inch above the main PCB by the metal chassis. Interestingly, the controller PCB mounted above the disk drives was the smallest I've ever seen on a PC-compatible. In operation the disk drives performed very well and could hardly be described as noisy; however, they are noisier than those on the M24 which, at least on earlier machines, were whisper quiet. The M19 is also available with a single 360k drive or with a 10Mbyte hard disk and one 360k floppy. However, with a hard disk installed, a fan

In perspective

Cheap IBM PC-compatibles probably represent the most cut-throat competitive sector of the microcomputer business and are currently suffering under a flood of *really* cheap Taiwanese products. The name Olivetti may mean a lot in terms of support when compared with cheap Taiwan clones, but there are some large, reputable manufacturers which make cheaper machines such as Commodore with its PC.

I would recommend a good look round the market before purchasing an M19 as there will almost certainly be a cheaper machine that will meet your needs. For example, one of the markets Olivetti envisages for the machine is the higher end education market, but I doubt that cost-conscious educational institutions will buy the M19 when they could have two identically-configured machines for roughly the same price of one M19.

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is needed to keep the unit cool. The main PCB occupies the entire base of the main system unit, although over half of it is obscured by the two disk drives. Even though it is as big as the machine itself, the PCB is still significantly smaller than that on the IBM PC, although it boasts an RS232 port, a Centronics port and colour display support.

The main processor on the M19 is a standard 8088 which is just a 16-bit processor with an 8-bit data bus. The processor is driven at the mundane speed of 4.77MHz. I was very disappointed at Olivetti's choice of processor and clock speed, as most modern PC-compatibles have followed the lead set by Olivetti with the M24 and used a full-blown, 16-bit 8086 running at 6 or even 8MHz. Olivetti's decision to use exactly the same processor and clock speed as the IBM PC only marginally helps compatibility (once again, Olivetti's M24 shows you can be very compatible at higher clock speeds), but it does make the M19 slow when compared with the competition. Surely, with all the research Olivetti did to make the M24 run at 8 and now 10MHz, it wouldn't have cost too much to give the M19 an 8MHz 8086 as standard. A go-faster option of 8088 driven at 8MHz will be available by the end of July, at extra cost. Certain chips were socketed rather than soldered directly to the board, presumably for this upgrade.

The main PCB looked well built and considerably less cluttered than I expected, due to the use of a large custom gate array which encompasses several functions including that of a colour card. Although the review machine was a late prototype, there was little evidence on the PCB of it being an unfinished product, except for one small area of TTL logic which was covered in patch wires. A 16k ROM containing the boot-up sequence, ROM BIOS and diagnostics is just visible underneath the disk drives alongside a bank of 256k RAM made up of 256k by one-bit dynamic RAM chips. There is sufficient room onboard to expand the system to a full 640k with parity (the basic system has no parity chips in place, just an empty socket). All M19 configurations come with 256k of RAM as standard.

With three blanking plates on the rear of the case you would expect to find three expansion slots inside; not so, the main PCB contains only two. Odd, and more than a little deceptive. What is worse is that these two slots are totally unable to take standard expansion cards as the space available could accommodate a card with half-card length and a third of the standard height. A dear price to pay for the dinky little compact system box. I don't have enough room with five cards, although I do appreciate that there is no need for my colour card or 80 per cent of my multi-function card.

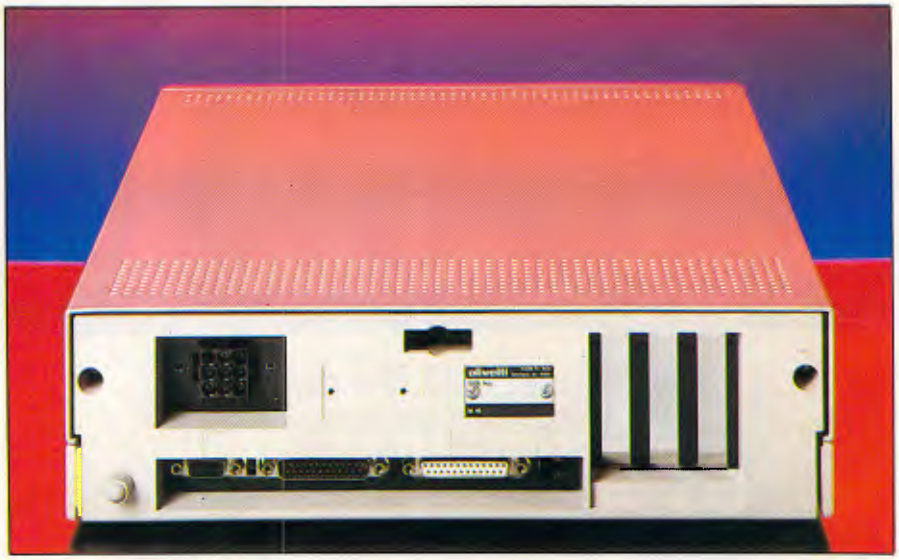
The two, half-height disk drives occupy most of the front panel

Olivetti, of course, has cards available in this miniature format, and there is no reason why some of the current cards couldn't be converted as the physical socket is identical to that on the IBM. In fact, Olivetti will shortly announce an Australian-made internal modem for the M19; it features 1200/75 and 300/300 baud rates and is capable of autodial.

Including this modem card, there will initially be five cards available from Olivetti. The other four are: a second RS232C port; a synchronous communications interface; an Olivetti proprietary local area network card (called Olinet) and, best of all, an SCSI hard-disk controller which will allow you to hang a whole host of third-party mass storage devices on the system.

If you're desperate to use a standard IBM type expansion card, there is one way to do this. At extra cost you could purchase an external expansion box with one slot for a normal expansion card — this box can also be configured to supply power to the main unit, should you wish to use a standard RGB monitor or Olivetti's colour monitor.

The monitor supplied with the M19 was monochrome and was also said to be a prototype and suffering from a contrast problem. Like the main system the monitor is finished in grey plastic,



The rear panel houses the usual collection of IBM-compatible sockets

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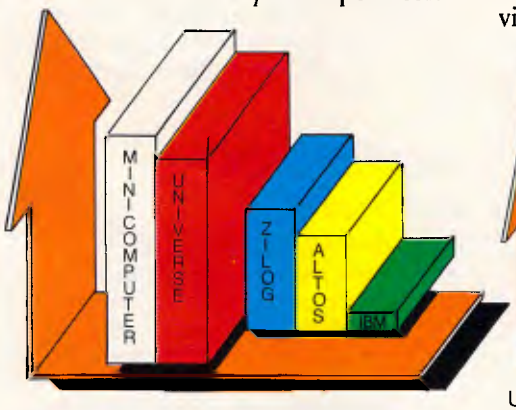

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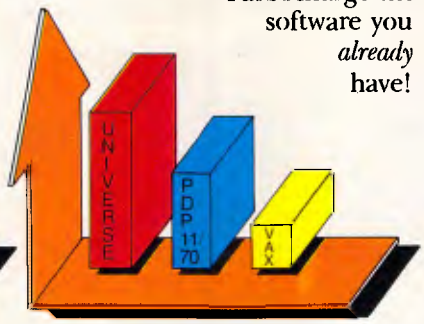

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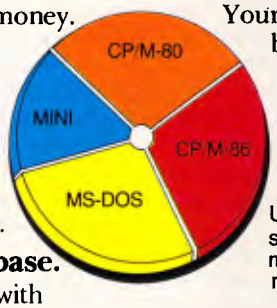

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Benchmark

The benchtest used was provided by BYTE magazine and is the Sieve of Erastosthenes prime-number program (10 iterations). Note that all performance is for a single user system only.

COMPUTER	PROCESSOR	OPERATING SYSTEM	LANG.	TIME (sec.)
AED UNIVERSE	80286/8	MP/M 8/16	C (D.R.I.)	1.8
ZILOG	Z8000	ZILOG	C	4.0
DATAMAX	80186	C-DOS	C (D.R.)	4.3
WICAT	68000	UNIX	C	4.7
ALTOS	8086	XENIX	C	6.0
LABTAM	8086	MC-DOS	Fortran 77	7.0
DEC	LSI-11/23	XENIX	C	9.3
IBM PC	8088	MS-DOS	C (D.R.)	12.4
OSBORNE	Z80A	CP/M	C (BDS)	15.2
DEC PDP-11/70		UNIX	C	1.5

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and along the front there are controls for contrast, brightness and the power switch. To my mind the on/off switch is too easy to hit accidentally considering that it's the power switch for the whole system. Also, it's not possible to just switch off the monitor to save the screen, while keeping the computer on — a lesson I learnt the hard way as I lost a few hundred words of text in a moment of forgetfulness.

I also found many operational faults with the monitor, among them a severe ghosting, a crooked display and a most worrying fault which occurred twice, whereby the monitor let out a loud crack and shot a splodge of brightness to part of the screen. I can only add that I hope all this was due to it being a prototype. Interestingly, I found no fault in the contrast; both text clarity and shading to simulate colour graphics were excellent.

The keyboard unit on the M19 connects to the main unit via a fairly short length of coiled cable and a DIN plug. This is one area where there seems to be no loss of quality in a effort to keep costs down. The keyboard quality on the M19 rivals the excellence of the IBM keyboard. The keyboard unit is higher at the back than it is at the front, which means it is angled slightly forward to give a good typing stance. This angle can be increased to any one of three settings by means of flip-down legs at the rear of the unit. A recess at the top right of the unit will accommodate the Olivetti mouse. Although this doesn't conform to any industry standard, both Microsoft and Digital Research, the major mouse-driven software producers, support it. And if this isn't enough, Olivetti will sell you software that emulates the Microsoft mouse — the most successful industry standard.

The keys are laid out in three logical groups and roughly modelled on the keyboard found on the PC/XT. The centre section is occupied by the main qwerty typing section which is a slight improvement on the PC/XT's. In particular the '/' key has been moved from its awkward position between the 'Z' and Shift keys; the 'Return' key has been enlarged to a decent size and the 'Shift' keys have been placed in their proper position either side of the space bar.

To the left of the keyboard there are 10 programmable function keys *a la* IBM PC or AT. To the right of the qwerty section, there is the combined numeric keypad and cursor key cluster. Above this are the 'Num Lock', 'Scroll Lock' and 'Caps Lock' keys, each with their own LED to indicate whether or not they are engaged. Also in this row is the 'Sys' key used on some networks and a key labelled 'PC/WP' which switches the keyboard configuration to one suitable for a proprietary Olivetti word processing system.

I liked the general feel of the M19's keyboard; the keys themselves were nicely sprung and had a very positive action suitable for touch-typing. Also, the blue on grey colour scheme with amber LEDs makes it one of the classiest looking keyboards I've ever seen — the overall effect is only spoiled by a cheap-looking marbled strip running across the top of the unit.

System software

In order to be compatible, all IBM PC-clones run some version of the MS-DOS operating system, usually version 2.11. The Olivetti M19 sticks strictly to this tradition by including a 'no frills' version of MS-DOS 2.11. This is all very well but it does make it very difficult to think of anything substantial to say, without repeating what has already been said and written many times before.

Seriously though, compared to machines with a similar specification, the M19 isn't cheap and I would have expected a company with the corporate power of Olivetti to sign up one of the 'friendly front ends' — such as GEM or Windows — to be bundled-in with the machine, something which small, cheap clone manufacturers don't have the power to do.

Applications software

Being IBM PC-compatible, the M19 is open to the widest range of application programs ever to be made available on a single machine architecture although some people believe there is still a greater number of packages available for the CP/M operating systems. Even if this were true, IBM PC packages are far more modern and better supported, so,

Technical specifications

Processor:	8088 running at 4.77MHz
ROM:	16k
RAM:	256k expandable to 640k on board
Mass storage:	One or two 360k IBM PC-compatible floppy disks. Optional 10Mbyte hard disk
Keyboard:	85-key, IBM PC/XT style
Weight:	8kg
I/O:	RS232C, Centronics and RGB ports. Two non-IBM-compatible expansion slots
DOS:	MS-DOS v2.11

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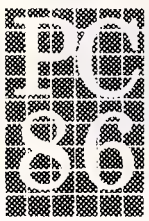

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Instead, they concentrate their efforts on turning out the highest quality diskettes they can ... because they sell them to the software publishers, computer manufacturers and other folks who (in turn) put their name on them ... and sell them for much higher prices to you!

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whatever application you want, from spreadsheet to golf-handicapping system or word processor to bakery control program, if it's not on the IBM PC the chances are *it's not available.*

Olivetti's previous PC clone, the M24, set a reputation as one of the most compatible machines available and included a different and faster processor to the IBM PC. One would expect the M19, with the same processor as the IBM PC driven at the same speed, to be even more compatible. I tried a wide range of programs on the M19 from the office collection, and everything ran perfectly, including the classic tests of compatibility such as Microsoft's Flight Simulator and Lotus' 1-2-3 (though all the clone manufacturers now ensure that their machines run these). In general, the Olivetti is one of the most compatible machines on the market today.

Incidentally, when I ran the *APC* Benchmarks, I initially tried to use the PC-DOS from my machine and IBM's BasicA. The M19 happily ran PC-DOS but, like all compatibles, failed to run BasicA as this uses Basic ROM routines which are strictly copyright IBM.

A quick search through the disks supplied with the M19 turned up a copy of GWBasic which is the only application supplied with the M19. Curiously, the Benchmarks are slightly faster than those for the PC, which must mean GWBasic is a faster Basic than BasicA.

Documentation

The review machine was supplied with one manual called the *M19 Starter Kit* which also contained three disks. This was spiral-bound, typeset and made heavy use of diagrams throughout. However, it really isn't enough for the absolute beginner and would be more useful as a simple setting-up guide and sales brochure for Olivetti's peripherals.

The three disks consisted of a *Tutorial/Introduction* to the M19 — which made up somewhat for the lack of this information in the manual — a system disk and a diagnostics disk.

The monitor has controls for contrast, brightness and the power switch

Prices

As is so often the case, the price of the machine wasn't fixed at the time of writing. The best estimate at this time is that the recommended retail price of the basic single floppy drive M19 will be around $2800. This includes a monochrome monitor; the dual disk drive system should sell for about $3200. No prices were available for the hard disk, expansion cards, peripherals and so on.

Conclusion

The M19 is a very well made, good looking PC clone, but that alone is insufficient to set it apart from the crowd. Having the Olivetti name behind it means the machine will be well supported but I really don't think that's enough considering its cost.

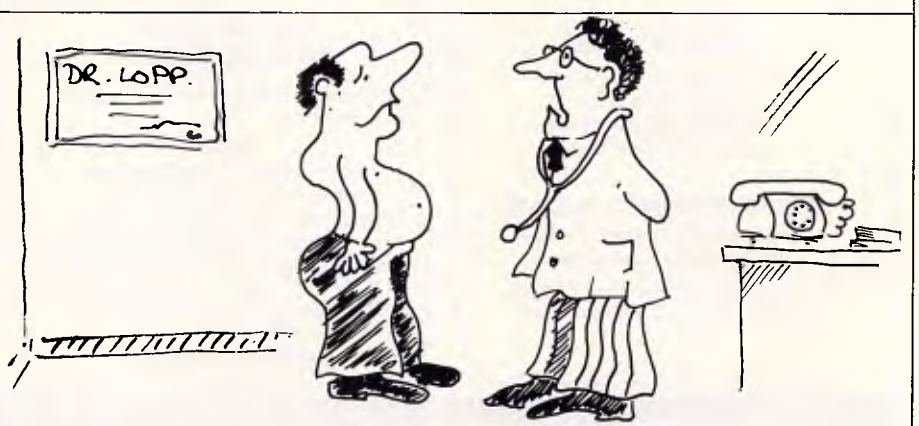
Olivetti sees the machine selling to a very distinct section of the market, including the executive who doesn't require too much computing power but wants a neat, compact unit and a terminal for a network. But even in this market there are better, and cheaper, machines. The omission of standard expansion slots is the machine's most worrying flaw which seriously effects its capability as a general purpose PC clone.

Overall, the machine is a disappointment, especially coming from Olivetti which had previously produced such a good machine in the M24. If the company had included the fast 8MHz processor and a friendly operating system front-end such as GEM, with no increase in price, this might have compensated for the lack of expansion slots and made it a viable proposition.

Benchmarks

BM1	1.4
BM2	4.9
BM3	10.4
BM4	10.8
BM5	11.5
BM6	20.8
BM7	32.4
BM8	34.3
Average	15.8

All timings in seconds. For a full listing of the Benchmark programs, see End Zone.



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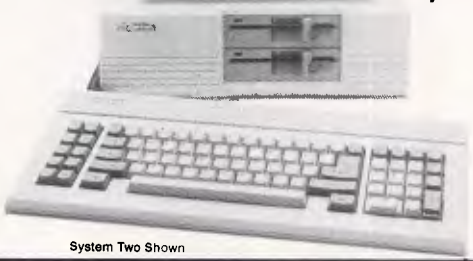

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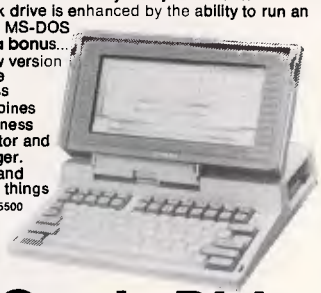

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Pictures from space

This month Robert Mudge explains how, among other things, you can receive pictures from weather satellites by connecting your micro to the radio receiver.

The old joke about 'Colour Radio' isn't as far from the truth as you might think, because pictures were sent by radio long before the start of television transmissions just after the Second World War.

Facsimile machines

In 1934, Britain's BBC sold a kit to build a facsimile machine: a device to make pictures by radio. At the BBC transmitter, pictures were scanned electronically and broken down into a number of parallel lines. These were sent sequentially as an audio signal varying in volume to represent the pictures' dark and bright bits. The facsimile machine was connected to the radio and reassembled the lines onto a piece of electrically-sensitive paper, recreating a replica of the original picture. This method of transmitting pictures by radio has been used extensively, and for a long time, by the world's press agencies who distribute their news pictures across the globe by short-wave radio. Anybody with a suitable receiver and facsimile machine can pick them up ready to print alongside text, probably sent by radio telegraphy.

Mechanical fax machines are expensive precision devices, but it is possible to find them second-hand in electrical junk shops — however, you have to be a capable enthusiast to get them going. Within the Wireless Institute of Australia there are people and groups who specialise in fax. The WIA is represented in all states of Australia. If you can't find them in your local area, contact the Federal Office in Melbourne.

Professional facsimile machines *are* expensive, but by linking a modern short-wave receiver to a home micro, amateur radio enthusiasts can transmit and receive pictures between each other at a fraction of the cost. Short-wave listeners can tune into these, and even into pictures transmitted by weather satellites 34,000 kilometres up in the sky.

This type of picture transmission is a kind of Slow Scan Television (SSTV). Our normal television produces a complete picture every 25th of a second, and each picture is made up of 625 lines. It needs to show this number of lines at this speed in order to create high-quality moving pictures.

Operation

To make each picture, a tiny spot starts at the top left of the television screen and sweeps across to the top right, getting darker and brighter as it goes so as to recreate dark and bright bits of the real scene. It then switches to the left again but a line lower. This process goes on until the spot has scanned the entire screen and reaches the bottom right corner, at which point the spot goes to the top left again to start a new picture. In reality the process is a little more complicated because the television shows the same picture twice: the first time using all the even-numbered lines, 312.5 in all; and the second time all the remaining odd lines, the other 312.5. Each of these is called a field — each field takes 1/50th of a second, so the two fields are shown in 1/25th of a second. However you look at it, that spot is moving very fast: it has to cover 625 lines in 1/25th of a second, so each line takes about 0.000064 of a second!

It all works well, but the radio signal has to be very high, from 50 million Hertz (50MHz) to one thousand million Hertz (1Ghz). It must be capable of carrying a frequency of about five megahertz (5MHz bandwidth) — this takes up a lot of radio room. The short-wave bands only go up to 30MHz and typically carry a frequency (bandwidth) of about 3KHz (3000Hz). This bandwidth is good enough to carry voice transmissions and narrow enough to get lots of channels into the available radio space. To transmit pictures by short-wave, the amount of information has to be reduced. This is done by reducing the speed of the line scan and also the number of levels of grey that make up the picture.

With the older systems, and most of the press transmissions, a photograph is loaded onto a drum in the facsimile (fax) transmitter. The drum then rotates at a fixed rate (60, 90, 120 or 240 revolutions per minute). Synchronised to the drum is a scanner which slowly moves along the length of the drum. The scanner usually consists of a light source and a photoelectric cell. The light shines onto a tiny spot of the photograph and the photoelectric cell picks up light which is reflected from its surface. The strength of the current coming from the cell depends on the brightness of the photograph at that point; the current is used to vary the volume (modulate) of an audio tone (about 2.5KHz), which is then transmitted on the chosen frequency.

At the receiver, a piece of electrically-sensitive paper is placed on a similar drum. As this rotates, a stylus rests on the paper and an electric current proportional to the loudness of the audio signal is passed through it. The higher the current, the darker the paper, and,

gradually, a facsimile of the original photograph is produced. There are numerous types of machines which may use different paper, including ordinary photographic bromide paper — but whatever the machine type, the principal operation is the same.

Information

There are a few other pieces of information needed before a picture can be successfully produced. Both drums must rotate at the same speed, and they must also be synchronised so that the edge of the picture appears at the correct place — it's no use if the edge appears smack in the middle of the receiving sheet. To do this, a synchronising pulse is included in the audio signal. When a transmission starts, there is usually a short period when only the synch pulses are transmitted (this ensures that the receiver drum has time to become synchronised to the transmitter).

The other essential thing is that the scanners on the transmit and receive machine both move at the same speed and so produce the same number of lines per millimetre. This is called the 'index of co-operation' (IOC). There are two fax standards: 576, which gives 3.9 lines per millimetre; and 288, which gives 1.9 lines per millimetre. The higher the number of lines per millimetre (scanning density), the higher-definition the picture. If the wrong IOC is used, the received picture will be distorted.

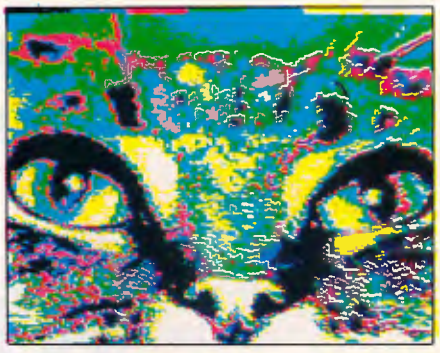
Enter the micro

For home enthusiasts and amateur radio enthusiasts, the microcomputer has taken over. Using a computer is simpler and much cheaper. The photograph is captured from a television camera in a digital frame store, and is then read out line by line at the appropriate rate. The digital brightness levels are used to modulate the audio tone, via a digital to analogue converter, which is then transmitted. Synch pulses are inserted at the beginning of every line, along with information to stop and start the receiver. At the receiver, the audio tone is used to generate a picture in the frame store via an analogue to digital converter, where it is then displayed on a visual display unit. Once in the frame store, the image can be printed onto paper using a dot-matrix printer.

There are a number of line standards for amateur SSTV, but the most popular is 128 lines by 128 pixels with 16 levels of grey between black and white. It takes seven seconds to transmit a picture like this and it looks almost as good as a newspaper picture. Other standards use more lines and pixels to increase the quality, but because they still have to be transmitted with the same bandwidth, the line rate has to be even slower in order to fit in the extra information — a 256-line by 256-pixel picture taking 32 seconds to transmit.

There are a number of dedicated digital SSTV systems on the market; the most popular is the ROBOT 1200c. This

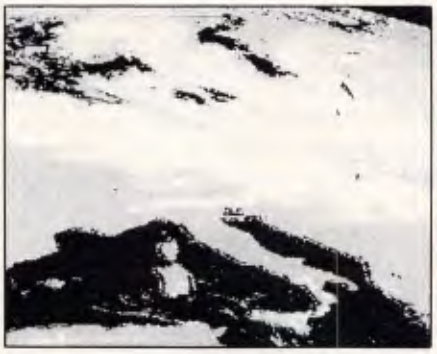
From a plain coat . . .



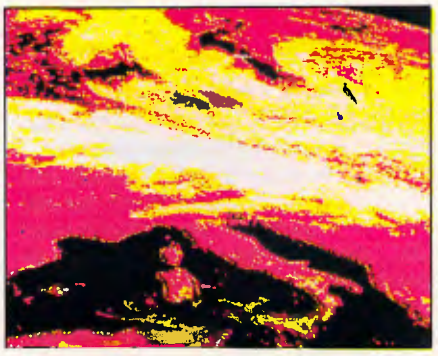
. . . to a technicolour coat

Before . . .

. . . and after

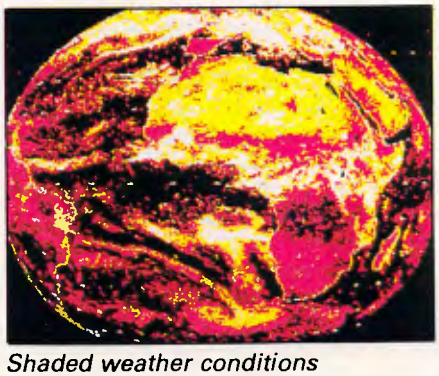


Italy's weather in mono



Italy's weather in colour

A leopard's black & white spots



Shaded weather conditions

A selection of pictures obtained from a microcomputer and a radio receiver.

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system can also transmit colour pictures and was used onboard the space shuttle 'Challenger' by astronauts Tony England and John-David Bartoe to transmit pictures from the shuttle to the world's amateur radio enthusiasts. This system costs well over $3,000, so is out of the reach of most enthusiasts. However, there is a much cheaper system which runs on the MicroBee, Commodore 64 and Apple micros.

The 'Listening Post' is a good introduction to RTTY, Fax and Morse code. This unit was designed by an Australian radio amateur by the name of Tom Moffatt (his amateur radio call-sign is VK7TM). It was published as a project in the July 1985 issue of Australian Electronics Monthly. There is a 'kit of bits' available from All Electronic Components in Melbourne. This kit has only 1 integrated circuit, 2 transistors and a few other components: it's very easy to build and costs just over $30. Some software is available with the kit, but programs for the MicroBee, Commodore 64 and Apple micros can be bought from *Australian Electronics Monthly* on disk (or cassette) for approximately $20.

The system is very easy to use, but finding the pictures on the short-wave bands and tuning them can be tricky and requires practice. Fax broadcasts by press agencies and other utility transmissions, such as weather maps, usually follow a published time-table — amateur SSTV transmissions happen randomly, and so some searching of the amateur bands will have to be done, sometimes fruitlessly. SSTV signals sound quite different from anything else. They can be quickly differentiated from the rest of the coded signals like RTTY (Radio Telegraphy) and TOR (Telex over Radio). A couple of good frequencies to try in are 11.030MHz and 13.550MHz. These frequencies primarily carry fax transmissions of weather maps for Australia and New Zealand.

Satellite transmission

For the listener there is another source of interesting pictures: those transmitted from space by weather satellites as they pass overhead. For 25 years, orbiting satellites have been sending pictures back to the earth which show the movement and position of clouds. The information is used by meteorologists to help in their daily weather forecasting. The equipment used by the professionals is similar to the mechanical fax equipment and is *very* expensive, but the system on the space-craft was designed with the amateur in mind.

The simplest satellites to receive are the American NOAAs. They are in a 'polar' orbit, which means that they pass over the North and South Poles. As they go around, the earth rotates below. They pass directly over any point on the earth's surface twice a day: once in light, the other in darkness.

Onboard is an SSTV system which sends a picture in a continuous strip. There are two pictures side by side — one shows the surface of the earth in visible light, the other in infra-red. Technically speaking, this system is called Automatic Picture Transmission, or APT. The picture is sent at two lines a second as an amplitude (volume) modulated audio tone. You need a special receiver to pick it up because it is on 137.62MHz, and in FM (Frequency Modulation) is well above the range of most short-wave receivers. The line scan on the satellite is crystal-controlled at two lines a second.

Accessible from some parts of the earth an interesting alternative satellite is 'Meteosat', a geostationary satellite about 34,000 kilometres above the equator. Geostationary satellites travel at the same speed as the earth rotates, and so appear to stay in a fixed position above the earth's surface. Unlike the Polar orbiting satellites which only pass overhead twice a day, Meteosat transmits pictures of the earth all day. Every half hour it takes a picture of the whole earth, in both visible and infra-red light. This is transmitted back to earth where it is enhanced and the coastal outlines are put onto the picture. The picture is split into a mosaic of nine elements which cover the whole earth; each of these pictures is made up of 800 lines. The enhanced picture is sent back to the satellite which then retransmits it for general use using a four-lines per second APT format.

Equipment to receive fax pictures from satellites such as Meteosat must be able to function on frequencies in the order of one and a half thousand million Hertz (1.5GHz) or more. It must incorporate a fair sized dish antenna and some rather fancy electronics. You and I can't afford it, though a radio amateur skilled in these areas would be able to build it 'on the cheap'.

In Britain there is a group dedicated to receiving fax transmissions from satellites and other areas. Called the 'Remote Imaging Group', it publishes a quarterly magazine and is ready and willing to help anyone wishing to receive satellite pictures. With a subscription of only two British Pounds per year, it's well worth joining.

The pictures produced by computer are very good. *If you thought computing was addictive, just wait until you start on satellite pictures.* END

Contacts

Wireless Institute of Australia
Federal Offices
3/105 Hawthorn Rd,
(PO Box 300)
Caulfield North,
Vic 3162

Listening Post Software
Australian Electronics Monthly
PO Box 289,
Wahroonga,
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SCREENTEST

Turbo Lightning

Borland's combined spelling checker, proof-reader and thesaurus incorporates basic word processing facilities and some rather novel options. Owen Linderholm perfects his writing style.

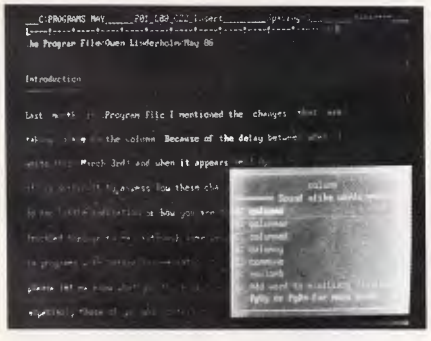
Amstrad's word processing computer, the PCW8256, has fanned the flames of interest in word processors to an unprecedented degree. In the US, plain word processing is almost as obsolete as the typewriter. Corporate America has bought its IBM PCs, and now it wants more from them than the simplest office functions. Spreadsheets should automatically extract information from raw data, and display pretty and meaningful graphs. Databases should be intelligent, and should understand English commands. Word processors should check your spelling, grammar and writing style, and preferably correct them, too. Not all of these things have been achieved yet, although various companies claim to have products which *can* do all these and more.

Turbo Lightning, the latest addition to the low-priced Borland range, is primarily a spelling checker, a thesaurus and an automatic proof-reader. Borland says that the package can do much, much more, and does provide some evidence to support its claim. The package is currently available for the IBM PC, and compatibles with at least 128k and two floppy drives or a hard disk. It has the potential to run on any MS-DOS system (and perhaps CP/M, eventually) with sufficient memory.

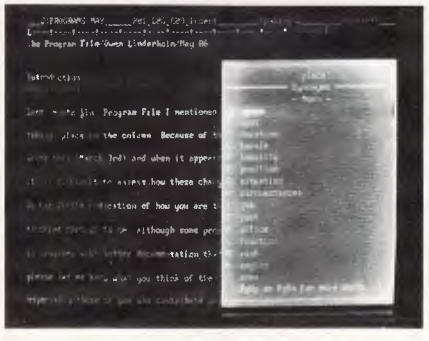
Turbo Lightning features the usual Borland packaging — a paperback book-type manual accompanying three disks which hold the software. The inclusion of the word Turbo in the product's name suggests that it is heavily linked to Borland's successful Turbo Pascal. On the surface, the name is the only piece of evidence for this, but reference is made in the manual to interfacing between Turbo Editor and Turbo Lightning. Turbo Editor is a series of modules, written in Turbo Pascal, to build up word processors or text editors. One of the Pascal modules hooks into Turbo Lightning to allow spelling checking of a different type from Turbo Lightning — this suggests that Turbo Lightning was itself written in Turbo Pascal, an incestuous relationship which may extend to several Borland products.

The Turbo Lightning disks contain various files which perform different functions. The system disk holds the Lightning files; a floppy disk version of the Random House dictionary; a floppy disk version of the Random House thesaurus; a very small version of the dictionary to fit into a small memory space; an auxiliary dictionary; and some last-minute update information. Another disk, the dictionary disk, holds the complete dictionary and thesaurus. The last disk contains a selection of dictionaries to fit into memory; a hard disk installation program; the Lightning installation file; and a few environment files with which to configure Lightning for various purposes.

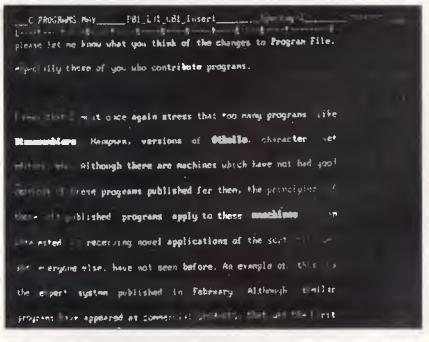
This list of disk files indicates that Turbo Lightning can be used on systems with various memory configurations and a floppy or a hard disk. The Turbo Lightning program plus window buffers, dictionary indexes, the auxiliary dictionary and display storage occupies 65k to 70k, depending on whether or not the screen is blanked while Lightning is in use. Five sizes of dictionary can be used, each using up different amounts of memory. There are three sizes of RAM-



Lightning's list of sound-alike words



A selection from the Thesaurus



Full-Screen Spell Check

SCREENTEST

resident dictionary, ranging from 6000 words through to 12,000 words to 16,000 words; these take up between 16k and 38k of memory. The other two dictionaries are based on disk, but can be transferred to memory if enough is available. The smaller of these dictionaries, for use with floppy disk systems, has approximately 50,000 words and occupies 106k if placed in memory. The largest dictionary, for use with hard disk-based systems, or systems with RAM disks or with large amounts of memory, has about 80,000 words and takes up 175k.

Menu selection

The mechanics of using Turbo Lightning are very simple. An installation program sets it up for use with your particular system; then, when the program is run, it sets itself up in memory in the background. The program can operate in various modes which can be altered according to the user's preference. In normal operation, Turbo Lightning is invisible until it is required. It can be activated either through a menu system or via hot keys which call up functions instantly.

The main menu appears as a one-line window at the top of the screen. The options listed are: Environment, Word Check, Full-Screen Check, Thesaurus, Set-up and Options. Each of these options can be accessed by the left and right arrow keys and the Enter key, and pulls down another sub-menu of the functions available under that heading. Each of the items on the sub-menus can be accessed by single-letter indexes or by the up and down arrow keys and the Enter key.

These menus pull down over anything else that is on the screen; when they are removed, whatever is underneath is replaced. One of the Set-up options allows the whole screen to be changed when a menu drops down, and this saves a small amount of memory.

The Environment option is used to select the working environment for Turbo Lightning. Several common applications are already set up, such as WordStar, DOS, Lotus 1-2-3, MultiMate, communications, Turbo Pascal, and so on. These Environments can be modified or changed completely and then saved for further use.

Environment Set-up

Environment controls the keys which are to be used as cursor keys; deleting keys; inserting keys; and how insertion and deletion work under that application. When Turbo Lightning is configured for new Environments, some of these values have to be discovered by trial and error, but they are all required by the program so that it can replace words correctly without altering the format of whatever is being worked on.

The next item on the menu is WordCheck, the use of which is obvious. The options under this item check the word at the cursor position and also check the last bad word; when the former option is selected, Turbo Lightning checks the word on which the cursor is placed, or the nearest word if the cursor is not on a word. A window appears in the corner of the screen furthest from the cursor, and contains a list of possible words to change or a confirmation of correct spelling.

When the spelling of a word is checked in the dictionary and found to be incorrect, Turbo Lightning produces a list of possible correct spellings in the window. These possible words are culled from the dictionary according to a few simple rules — the program calls this list a 'sound-alike' list. The words are organised according to the words which Turbo Lightning thinks are the most likely configurations. The means of coming up with possible alternatives involves a list of commonly misspelled or mistyped words, the sound of the words and their length. Borland's reasoning behind this policy is that when people incorrectly spell a word, they guess at the correct spelling along phonetic lines.

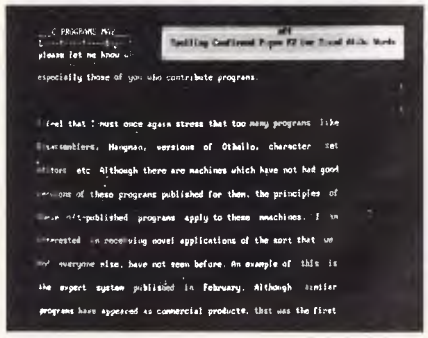
This is perhaps a misguided policy on Borland's part, as almost all *my* typing mistakes are the products of clumsy fingers, not poor knowledge of spelling. If I frequently type a nonsense word like vyte in place of byte, for example, Turbo Lightning will produce vote, voted, voter, votes, vitae and vacate as the six most likely alternatives to the wrong word.

The phonetic replacement stragegy is, however, not taken far enough. Silent 'p's and 'ph' sounding like 'f' are common phonetic mistakes, but Turbo Lightning produces a list of words which are approximately the same length as the misspelled word, and which all begin with the same letter and have varying changes made to the other letters. The only exceptions are short, common words such as 'the', 'what', 'why', and so on; mistakes related to these words are analysed as wrongly-ordered words, and the correct words are produced.

Another method of checking spelling via Turbo Lightning is to check words a screenful at a time; this is the third option on the menu bar. There are two sub-options available from this selection — Full-Screen Check and Review Last Full-Screen Check. The Full-Screen Check scans every word on the screen and highlights any which have been misspelled. The Review Check option reviews the results of the last Full-Screen Check and re-highlights all the misspelled words unchanged since then.

Perhaps the most useful feature of the Turbo Lightning spelling checker is the Thesaurus option, which has no sub-options attached. It looks up the word which is underneath the cursor in the Thesaurus, and provides a list of alternative words or phrases of the same meaning. If the word is not in the Thesaurus, then you are given the option of finding a sound-alike word. This is a very useful feature, as it allows the Thesaurus to look at words which have been derived from Thesaurus-resident words. The Thesaurus is convenient and easy to use and provides plenty of inspiration if the exact word just won't spring to mind.

Turbo Lightning can be configured to some extent from within the program. The Set-up option is called, and allows the auxiliary dictionary name to be changed, as well as the names of the main dictionary and Thesaurus. These changes, plus any changes made to the Environment and Options items, can be saved.



A correct spelling

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The final item, Options, allows the automatic proof feature to be switched on and off, as well as the Confirm window. This is the window which displays a message confirming that a word is spelled correctly. The hot keys which directly access Turbo Lightning may also be changed via this menu option.

Modes

Turbo Lightning operates in three basic modes, the first of which is a straightforward spelling checker. This operates on single words, or on a screenful of words at a time. It can also be accessed via the undocumented Lightning Engine interface which Borland has so far kept shrouded in mystery. Turbo Editor uses this interface to check immediately the spelling in a whole document, using optional query and replace, and has all the features expected of a spelling checker, which are missing from the basic Turbo Lightning program.

Auto Proof is a novel option. Borland claims that this part of the program acts as an automatic proof-reader but, in practice, it checks the spelling of each word as it is typed. When you have finished a word and enter a space, a full stop, a coma, or whatever, Auto Proof checks the word and beeps at you if it thinks it is incorrect. This allows a correction to be made, or the last-bad-word function can be utilised by hitting a key, and a list of suggested correct spellings will appear. So, Auto Proof mode is effectively a check on spelling errors made as you type, which turns out to be very useful for catching all those little errors such as *seperately* (BEEP) — whoops, that should have been *separately.*

Weaknesses

Turbo Lightning has several faults. Firstly, there is the common complaint about all American programs — their idiosyncratic spelling. The result is that the precious space (about 200 words) available in the auxiliary dictionary has to be filled with spellings of words such as colour and realise (*American* — color, realize), which reduces the number of technical words that will fit. (Turbo Lightning would also have been considerably improved by the addition of a facility to check a whole document from within the program, instead of forcing the addition of an extra program to interface with its internal workings.)

Turbo Lightning is difficult to use with a 256k, dual-floppy system because the disk-based dictionary has to be resident in one of the drives for the program to be of much use. This limits other activity to one disk drive, which can be awkward. I was forced to keep files very small, or resort to disk-swapping.

Conclusion

This Turbo Lightning spelling checker, thesaurus and proof-reader is only *one* application of the Turbo Lightning Engine, if Borland is to be believed. A technical appendix to the manual states that Turbo Lightning can be called by other programs, and so can be used as a tool to enhance their facilities. The purpose of the Engine is to allow quick, easy access to large reference databases of all sorts, but apparently the only limitation is that the databases must be based on words, which means that access to numerical information is not allowed.

Access to all information depends on data compression, which reduces the data to small chunks which Lightning can handle. Lists of keywords are used to access the information, and are compressed into an index file. There is more technical information in the index, all of which indicates the general workings of Turbo Lightning but describes nothing in any particular detail. This capability has been reserved for the future, and mention is made in the Read.me file of a package called Turbo Wordgames which will be a set of Pascal programs with hooks into the Lightning Engine, plus descriptions of how the programs work.

The Turbo Editor package does already have a simple hook into the Engine, but it is a very simple one and no explanation is given as to how it works.

One possibility for the implementation of this kind of software is for help in accessing compact disk information systems. Borland's founder, Phillipe Kahn, recently addressed a conference in the US, organised by Microsoft, on compact disk systems, which suggests that Borland has considerable interest in this area. One obvious step is to use Turbo Lightning, or similar programs, for access. Compact disks lend themselves to storage for encyclopedias, for example, due to storage problems. As compact disk systems, or worm drives, can only be written-to once, it makes sense to input a large volume of data in an orderly manner: the combination of compact disk and Turbo Lightning is, potentially, a powerful one.

However, this is all speculation, and, for the moment, Turbo Lightning only has one basic purpose: it is useful for anyone who does a lot of typing on a computer, and who is likely to make many spelling mistakes. It is also useful for anyone who uses a word processor, and who requires swift access to a thesaurus. But for other purposes, even when checking the spelling in a whole document, Turbo Lightning has limitations.

As Turbo Lightning has a great deal of potential, it may well be a product to keep in the back of your mind for the future.

Turbo Lightning costs $175 and is available from leading computer suppliers.

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SCREENTEST

Mumps

Although it was first contracted in a hospital, the Mumps we look at here is a database language rather than a popular disease. Mumps, however, is a database system with a difference. Ian Davies takes a look.

In some ways, Mumps is 30 years behind the state-of-the-art in data management systems. In other ways, it's 10 years ahead. In either case, Mumps takes a dramatically different approach to most other products on the market, and is worthy of careful examination by anyone thinking of designing their own DBMS.

Mumps was developed in the 1970's at the Massachusetts General Hospital, and derives its name from the MGH Utility Multi-Programming System. It was designed to be highly interactive, simple to use, multi-processing and efficient. Like many DBMSs, Mumps attempts to broach the 'end-user computing' hurdle, providing facilities so powerful and so easy to use that anybody can start performing productive work after a few hours introduction.

The two major selling points for Mumps are programmer productivity (two to five times normal throughput), and the ease with which applications can be transported to other machines. Mumps even has standards set by the ANSI organisation which cover all implementations. The version of Mumps under review is called CCSM, developed by Comp Computing of Houston, Texas. CCSM follows the ANSI standard Mumps, and is written for MS-DOS machines.

Overview

I like to think that most data management facilities have their own flavour, or feel. Mumps is definitely one that does. Its emphasis is on simplicity, regularity, brevity and multi-programming. In some ways, this makes it similar to Unix — even though one is an operating system and the other is a DBMS, they both 'feel' to have similar design objectives.

Mumps insulates the user from the host operating system. Indeed, Mumps provides its own operating environment, utilising pre-formatted MS-DOS files as its own virtual disks. Thus to the user, file names, directories and volumes bear no resemblance to the MS-DOS standards.

"The two major selling points for Mumps are programmer productivity (two to five times normal throughput), and the ease with which applications can be transported to other machines."

Special Mumps utilities must be used to rename, delete, print or copy files, whether they be data files or programs. Everything resides within the Mumps virtual disk files, and only Mumps can operate upon them. This is probably not a bad approach for a DBMS with a heavy emphasis on multi-programming, as MS-DOS provides no real facilities for record locking, multi-tasking or contention detection.

The user, once within Mumps, can forget the normal operating system. Even the Mumps editor, ZE, is the only one which can be used without first copying programs out to operating system files.

Multiple users are supported by means of serial ports, with a maximum of 16 being supported. The Quadram serial port cards are used to expand past the normal limit of two serial ports on PC compatible machines. Any type of vaguely smart terminal can be plugged in and used.

The Mumps language is slightly Basic-like, and the DBMS — well, the DBMS is something else.

DBMS

The DBMS isn't.

This is one of the most characterising, interesting and powerful features of Mumps.

Consider, for a moment, the problem facing most DBMS's. Programmers want to insert records, delete records, find records, update records, and utilise various abstract ideas such as indexes. In addition to the DBMS language providing facilities to operate on normal variables (memory variables, working storage, local variables — call them what you will), it must also provide operators to affect the database. Thus the average DBMS language has two distinct sets of operators — one for working on the database, and one for working on non-database items.

Even the data structures are duplicated (not in the dBases of the world, but certainly in the fatherly figure of COBOL/IMS). Added to this are the concurrent update considerations. Often something which is non-database must be placed in the database simply so that collision detection can be used.

Mumps does away with all of this. A revolutionary idea which simplifies data processing by one whole dimension.

Mumps does not differentiate

```
                              PROGRAM:  COMFIL

COMFIL   ;MG,,,;9AUG85 1:45PM;DATA BASE PROGRAM;
         K  W #
START    R !,"DATA BASE",!,"ENTER '*' OR SEARCH KEY: ",IN,!
         G:IN="*" ENT Q:IN=""  S NM=""
SCH      S NM=$O(^(PER(NM)) G START:NM="",SCH:^PER(NM)'[IN
PRT      W ! F I=1:1:6 W $P($T(TAB+I),";",2),": ",$P(^PER(NM),"~",I),!
         R !,"'C' FOR CONTINUE ",X,! G SCH:X="C",START
ENT      F J=1:1 D INPUT G START:X="." Q:U="END"
CHANGE   R !,"CHANGE # ? ",J,! G REC:J["N",CHANGE:J'?1.N S U=$P($T(TAB+J),"
        ...:",2) G:U=""!(U="END") CHANGE D INPUT G END:X=".",CHANGE
REC      S ^PER(NM)=NM_"~"_STR_"~"_CI_"~"_STA_"~"_TNO_"~"_COM G START
INPUT    S X=$T(TAB+J),U=$P(X,";",2) Q:U="END"
         S TST=$P(X,";",3),REF=$P(X,";",4)
         W J,". ",U,": " R X I @TST S @REF=X W ! Q
         W " -- BAD FORMAT -- PLEASE REENTER",! G INPUT
TAB      ;
         ;NAME;X?2.A.E;NM
         ;$TREET;X?.E;STR
         ;CITY;X?2.A.E;CI
         ;STATE;X?2.A.E;STA
         ;TELEPHONE NUMBER;X?3N1"~"4N!(X?1"("3N1")".1" "3N1"-"4N);TNO
         ;COMMENTS;X?.E;COM
         ;END
```

Fig 1: A simple Mumps database program.

between database variables and memory, or working storage, variables. Everything looks like a memory variable, and thus only one set of operators are provided and must be learned. The only distinction is between local variables (which only you know about), and global variables, which name is prefixed by '^', and which every user knows about.

So far so good, but what about traditional records, indexes, searching, and so on. All this is dispensed with as well. Instead, the normal array construct is the heart of the DBMS. It works like this:

Any variable, local or global, may be subscripted — thus forming an array. The subscripts however, are not just restricted to numbers — alphanumerics such as a name or an address can be used as well. To make this work, the arrays are sparse matrices implemented as B-Trees. This means that only those elements which are actually used are actually stored. Normally this involves some degree of searching, but by using a B-Tree, the search overhead is greatly reduced.

Thus to find a record, it is simply a matter of subscripting an array with the desired key values.

Everything in Mumps is implemented in virtual memory, thus global variables retain their values with the power switched off. Even programs are handled the same way. In fact, early versions of the Mumps editor were written in the Mumps language.

It's really quite disconcerting to scan through a DBMS reference manual and not find any of the traditional operations such as find, insert or delete. Mumps does provide Open, Close, Read and Write commands, but these are not used in the normal way. In fact, a complete database style application can be written without any disk Read or Write statements.

Additionally, Mumps approaches data types in the same way — something which modern DBMSs are now tending to do. Very simply, data types do not exist. All variables are alphanumeric, it's just that some variables happen to contain valid numbers and, when they do, arithmetic can be performed upon them. Thus alphas can be concatenated with numbers freely. The data type is coerced depending on the context and the current value.

It's all really quite clever. Even the foundation of all modern database systems — the record description — is missing. Experience has shown that it is a good idea for the structure of a database to be described in one place only, and for the programs to be as independent of the structure as possible. Mumps not only does away with the database definition, it also does away with any form of record layout — even something as rudimentary as a Basic Field statement.

Mumps is described in the glossies as being able to accurately model real world hierarchical data relationships. Even the way it does this is simple, neat and concise. Effectively, each extra level of array subscript forms the next level down in the hierarchy. Normal hierarchical database rules apply, in that it is not possible to set a value for PEOPLE(DEPT,EMPNO) unless the department already exists. Similarly, deleting PEOPLE(DEPT) will also delete all employees in that department.

Commands:	BREAK	CLOSE	DO
	ELSE	FOR	GOTO
	HALT	HANG	IF
	JOB	KILL	LOCK
	NEW	OPEN	QUIT
	READ	SET	USE
	VIEW	WRITE	XECUTE
	ZASSIGN	ZASSIGNJ	ZFLUSH
	ZGO	ZLOAD	ZONLINE
	ZE	ZH	ZI
	ZP	ZU	
Functions:	$ASCII	$CHAR	$DATA
	$EXTRACT	$FIND	$FNUMBER
	$JUSTIFY	$LENGTH	$NEXT
	$ORDER	$PIECE	$RANDOM
	$SELECT	$TEXT	$TRANSLATE
	$VIEW	$ZNAME	$ZORDER
	$ZZ		
Graphics:	\ARC	\BAR	\BOX
	\CIR	\CLOSGRAF	\CLR
	\DELBOX	\DELCIR	\DELHCUR
	\DELLN	\DELTCUR	\DISPLAY
	\DISPLAYO	\FCIR	\FILL
	\FLOOD	\FLOOD2	\GPRINT
	\GREAD	\GWRITE	\INITALPH
	\INITTCUR	\INITGRAF	\INITHCUR
	\INITMASK	\LNABS	\LNJOINT
	\LNREL	\MARKABS	\MARKREL
	\MHCURABS	\MHCURREL	\MOVEABS
	\MOVEREL	\MTCURABS	\MTCURREL
	\PIE	\PTABS	\PTREL
	\RBOX	\RCIR	\RLNABS
	\RLNREL	\SCROLL	\SETASP
	\SETCOLOR	\SETDEV	\SETFONT
	\SETGPRIN	\SETHTSTY	\SETINTER
	\SETLNSTY	\SETLNWID	\SETPAL
	\SETPALC	\SETPRN	\SETSCRN
	\SETSTANG	\SETSTEXT	\SETTEXT
	\SETTXCLR	\SETWORLD	\SETXOR
	\SHIFT	\STEXT	\VPAN

Fig 2: Mumps language summary

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The only real weakness with the whole approach is that secondary indexes are rather hard to arrange. It is possible to create an inverted file, and this can be an auxilliary file which constitutes a secondary index, but it must be maintained through your software.

Language

Since Mumps provides a total operating environment, the application programmer cannot use his favorite language to drive the DBMS. Instead, the integrated Mumps language must be used.

The language is one of the smallest around, consisting of only 22 commands. The main commands are Do, to start a program running; Set, which is similar to the Basic Let statement; Write to display on the screen; and Goto. All commands can be abbreviated to their first letter. Other commands include For, If .. Else, Read for terminal input and Lock.

Functions include $ASCII, $Char, $Extract for substring slicing, $Find for string searching, $Justify, $Length, and $Random. All function names can be abbreviated to one or two characters. Conspicuous by their absence are all the normal trigonometric and mathematical functions usually found. Two special functions, $Order and $Next provide the ability to search the arrays. Since the array subscripts are not simple integers, it is not always possible to use a For loop to search an array; for example, FOR NAME="ADAMS":"ZAPHOD" does not really make sense. These functions return the next subscript in the machine collating sequence.

Binary operators provided include the normal four functions: modulo division, integer division, relational operators, string concatenation, extended pattern matching and boolean conjunctions. The customary exponentiation operator is, however, omitted.

"Everything in Mumps is implemented in virtual memory, thus global variables retain their values with the power switched off."

A multitude of system variables is provided for testing I/O results, terminal configuration and the like.

I found the language quite difficult to use at first, mainly because of its somewhat dated parsing standards. For example, if the syntax requires a space between two items, such as "SET A=...", then there must be exactly one space — any extra and a syntax error results. Similarly, if a space is not necessary, such as following an equal sign, then you should not put one in. I'm sure that it's just a matter of getting used to it.

Unfortunately, it seems that Mumps programmers really like to abbreviate commands to the one or two character minimum, thus making the average Mumps program quite unreadable, as you can see in Fig 1.

A graphics version of Mumps is also available, taking the form of extended options on the Write command. The graphics are almost as powerful as in Microsofts' GWBasic, so you can build almost anything you like, just don't expect to generate bar charts on demand. It's definitely a 'do-it-yourself' situation, (like the rest of Mumps).

There is no screen painting facility — not even to the extent that dBase provides, and there is no sort command. Either you've got to make sure that the array subscripts store the data in the order you want to see it, or you've got to write your own sort routine.

While this approach of an 'operating environment' is all very well, you need to be sure that it's done properly, and it may not have been in CCSM. I tried to load an array where the total size was greater than the virtual disk volume. The result was a complete system hang. Upon rebooting, it seemed that CCSM had managed to overwrite some of its own initialisation code. Every attempt to start CCSM resulted in syntax errors in system routines. To recover, I had to re-copy the virtual volume from a floppy, thus losing everything I had placed in it. The moral of the story is, don't let your virtual volumes fill up.

The editor, ZE, is also something a little less than people have come to expect these days. It is a full screen editor, providing average editing facilities, yet includes some oversights. For example, the area of each line preceeding the first tab is reserved for labels, but it is not possible to edit this part of the line. One nice touch is that ZE prompts you for a system name, programmer initials and a few other pertinent details which it stores in the program for you.

Utilities

A whole range of utilities are included in CCSM Mumps. Some of these are implemented as Mumps programs; for example, Snoop to see what's going on in the system, multi-tasking-wise. The majority, however, are accessed through the ZU command, which is an entire utility subsystem. ZU provides facilities

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Multi-user	Yes
Multi-tasks	Yes
Max Users	16
Max digits	14
Special disk format?	Yes
Link to ASCII files?	Yes, via programs
Fixed record structure	N/A
Amend record structure	N/A
Link data files?	Yes, via programs
Number sort fields	N/A
Max number of keys	limited by disk space
Max key size	127 bytes total for all keys
Data validation	Good
Unique keys?	Mandatory
Store calculated data	Yes, via programs
Query facility	No
Report generator	No
Screen painter	No
Screen manager	No
Max field length	255 bytes
Max record size	limited by disk space
Editor	Yes
File size fixed?	No, but cannot exceed virtual volume
Data types	N/A
Fixed length record stored?	No
Number data files open	limited by disk space
Totals & statistics	No
Graphics	Yes, via programs
Interaction methods	Command line and menus
On-line help	No
Tutorial	Yes, manual
Reference manual	**
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Fig 3: Features and constraints

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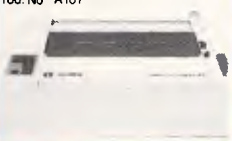

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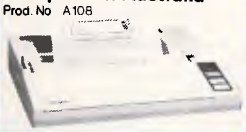

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to copy, print, delete, rename and perform global string substitution. Additionally, routine names can be listed and data can be packed for efficiency. The system shutdown is one of the utilities, thus to exit CCSM, the command is ZU <enter>, 11 <enter>. No wonder I didn't guess it!

Other utilities list all local variables, select I/O devices, edit device tables, perform cross-referencing, show system status, kill subtasks and verify system integrity.

CCSM can also keep a complete error log, which can be activated for different types of errors, listed and deleted.

Documentation

The main CCSM manual is broken into three sections. The first is an introduction to Mumps which discusses each feature in the context of its use, without getting too detailed.

The second section deals with the CCSM implementation of Mumps, discussing the various Z commands, the system variables, graphics, and so on. The third section covers native Mumps.

The overall result is terrible. Most of the manual seems to have been written by the programmer who implemented CCSM. It tends to include lengthy BNF syntax definitions, without actually telling you what use each particular feature is, or what other associated features exist. I found it was constantly necessary to switch between the three sections, none of which were cross-referenced, and only one of which was indexed.

Additionally, we were provided with a pocket guide, a 'cook book', and a Mumps introductory text. Each of these was equally bad.

MUMPS Toolkit

To aid system development using CCSM MUMPS, the Australian distributor has released a programmers tool box. This collection of utilities was originally developed by Patterson, Gray and Associates, and is licensed to Comp Computing, the authors of CCSM MUMPS.

Described as being "similar to SideKick, but far more advanced", the product isn't. Whereas SideKick is a memory resident 'hot-key' activated set of utilities for use within any software, the MUMPS Toolkit is a set of MUMPS programs which can only be used within MUMPS, and are designed to assist the MUMPS programmer. Each of the utilities are invoked by command, rather than by 'hot-keys'.

A total of eight utilities are provided, ranging from the humble ASCII table display up to some truly useful ones. A pop-up calculator can be called from within any MUMPS program by a single command for on-the-fly computations, and the result of the last calculation is left in a MUMPS variable so that the application program can pick it up. As well as providing the basic five functions, the calculator can also perform trigonometric and advanced arithmetic operations.

A note pad facility is included which can also be called from anywhere by a single command. Notes are given names, as well as being date and time stamped, and may be rapidly browsed. In a multi-user environment, notes are collected by 'line number', which means that users of a particular terminal will only see notes created on that terminal. The note pad is a rather rough implementation: for example, the back space key is not recognised. Similarly, word wrap only occurs when initially creating a note — subsequent editing

Goto page 113

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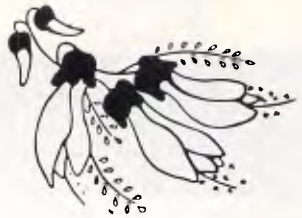

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LETTERS

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Of mice and men

I was really surprised to find the mouse did so well in Dennis Freeman's test ('Man or Mouse?', *APC*, April) since the mouse had two paws tied behind its ears. One important defect in the article is that it set up a 'straw man'. Few would deny that keyboard operations are well adapted to word processing, and that it is hard for mouse-driven software to perform better than a keyboard system in trained hands. But even leaving this aside, the review had a number of problems.

One problem was that it did not distinguish the task of learning to use a mouse-driven word processor from the task of learning to use a mouse. The latter is a motor skill which, once mastered, can be applied to any application. Thus it took Dennis three hours 35 minutes to feel he could do anything he wanted, not just with Word, but with any other mouse-driven application that might later come his way. By contrast, the three hours and six minutes it took him to learn the keyboard equivalents was time spent learning to use Word alone. Move to a spreadsheet or another word processor, and it would all have to be learned again (with the probability of confusion the next time he used Word, into the bargain).

The other problem was that Dennis insisted upon using the mouse in an almost completely 'dumb' fashion: that is, reaching for the mouse even when keyboard equivalents would have been quicker. The advantage of the mouse varies with different tasks, and a sophisticated mouser employs the keyboard for those things that it does best. Dennis was contrasting sophisticated keyboarding skills with those of a learning mouse user, which is no more fair than it would have been to use as his subject a 'hunt and peck' typist with no previous computing experience.

One advantage of mouse-driven, pull-down menus, at least on the Mac (I cannot speak for the Apricot), is that each common command is accompanied in the menu by its keyboard equivalent. This means that for the most part, you only use the mouse for positioning the pointer and highlighting pieces of text (which is what it does best), shifting it away from the text only on the first occasion that a command is invoked (which serves the dual function of invoking the command and reminding you what the keyboard equivalent was).

Which brings me to the principal advantage of mouse-driven software. Even those whose major computing activity is word processing do not necessarily use the same word processor every day: some take a holiday once in a while; some find themselves using a different word processor at work from the one they have at home. With a conventional system, these people have a frustrating time reminding themselves of the commands appropriate to a particular environment, and some seldom-used commands have to be looked up in a cumbersome manual each time they are employed — never with a mouse. WIMP technology enables you to look through all the available menus with a sweep of a mouse, and find the right command instantly.

This same feature makes learning a new software application simplicity itself. As long as you know what the application is supposed to be able to do, recourse to a manual is generally unnecessary. Therefore, the resistance to learning new techniques and improved facilities (which normally plagues everyone except the computer enthusiast on conventional machines) is rare in a mouse-driven environment.

We come back to my earlier point. The test was constructed on the assumption that learning to use Word would be a fair test of mouse technology, but this assumption is based on a pre-WIMP view of what is involved in learning a new application. A sophisticated 'mouser' would find that he already had most of the skills needed to employ Word, and would find his mouse-driven word processing at least a match for keyboard-based word processing. Note that I do not claim mouse technology to be superior for this application. It and programming are perhaps the only applica-

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tions which do not benefit greatly from mouse technology (though even these applications take less effort with a mouse, as Dennis pointed out). But try moving to spreadsheet, graphics, database, drafting, or music writing with a mouse, and compare the difference then!
M Franklin

Yes... but wouldn't it be nice to have standard mice and WIMP conventions, not one-button two-button or three-button types with incompatible clicks?

Bad attitude

I put fingers to keyboard to express my disappointment in your magazine's apparent attitude towards the circumstances under which the MicroBee Gamma was released. Surely *APC* and *YC* don't indulge in such petty squabbling. Each magazine has enough merit to be bought every month, and they complement each other very well, providing the reader with not only news, reviews and such, but some insight into the theories on which modern computing is based.

Being a 'Bee owner, I may very well be biased, but I feel that both magazines should support to a reasonable extent, the products which emerge from Micro-Bee Systems. Without that company, the Australian personal computer industry would be one of minor assembly plants, and a magnet for foreign systems. My cynical point of the day, upon hearing about the huge sales (and targets for expanding these), which companies like Apple and Commodore make; why don't they use Australia for more than a sales dumping point? Perhaps some assembly or sub-contractor manufacturing; certainly some R & D. Without these inputs, their credibility must surely be devalued in the eyes of the Australian PC user.
C Zymaris

Hypocricy

Regarding Noel Williams' February monologue concerning nonorganic life.

Mr Williams' qualifications for an object being alive, though never stated, resolve into the following. He insists that life must be carbon based and that the object must be dedicated to supporting itself.

Why must life be carbon based? It is actually accepted that on a planet rich in flourine, an *organic* silicon/flourine system would be viable. The key word here is "organic".

Why must life be the sole dedication of all live creatures? People are not designed to "stop", but computers are generally required to be turned off and on occasionally. Is it a serious objection that they are functional when turned on again? Humans sleep, many animals hibernate, yet they are perfectly normal when they wake up! Given this, why can't the computer do something other than be alive, and then be returned to normal functioning as a live object.

Objections to simulations of life are simply Mr Williams insisting that all life shares an environment he finds convenient. And in discarding symbiotic systems from life he implies that his arm is not alive, for every cell would die were they to be separated from this body!

What are Mr Williams' qualifications? He indulges in all the contradiction and emotive wordplay of which he accuses Mr Simons. In the final count, he is afraid that nice naturally (divinely?) created life could be similar, let alone inferior to, designed and manufactured organisms.
A Fry

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Philip Feldman

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LETTERS

Mac mix-up

I must apologise for providing inaccurate information to *APC* in reference to the enhanced 512k Macintosh model.

Exactly where the system broke down I am not certain. However, the information provided was believed to be accurate and available for publication (albeit by a few minutes) at the time I was discussing PC 86 and the new Macintosh family with *APC*.

As it turned out, I was dealing with a hotch potch of US market information and draft local plans that did not take into account various timing differences in Macintosh Plus launch, or the availability of the Macintosh Plus keyboard on the Australian version of the Macintosh 512k/800.

M Buchanan
for Apple Computers Australia

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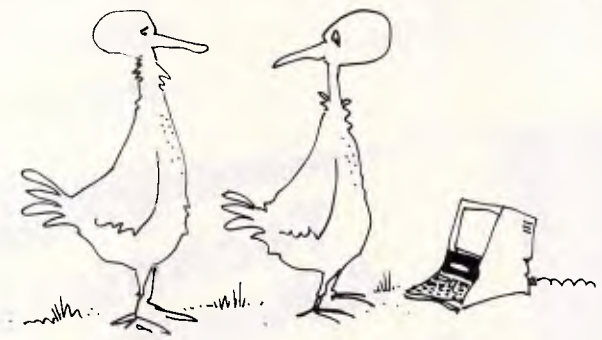

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Ready!

Ideas processors such as Brainstorm and ThinkTank are no longer a new concept, but co-residency is. This impressive package sits in your micro's memory and is designed to enable you to achieve maximum efficiency. Benjamin Woolley structures his thoughts.

The idea of an 'ideas' processor is seductive; what more useful application of a computer could there be than one that structures and arranges the jumble of ideas and half-thoughts that spill out of our minds every day? So, when Caxton launched Brainstorm (reviewed in *APC*, February 1984) there was, naturally, a good deal of excitement.

Meanwhile, in the States, a similar but separate line of development was being pursued. There it emerged as the 'outline' processor. Packages like Ashton-Tate's Framework and Living Videotext's ThinkTank offered 'outlining' as a means of structuring information, designed to help users to order and make sense of complex ideas.

Like Brainstorm, the assumption behind outline processors like ThinkTank is that ideas split up into a sort of hierarchical tree of headings and sub-headings; a single trunk with many branches with many boughs with many twigs with many sprigs. The tree is then the totality of the outline.

An example outline for this article, compiled using ThinkTank, might be:

```
+ Intro
  + Market
    — Brainstorm
    — Framework
    — ThinkTank
  + Outline processors
    + Theory
      — ThinkTank example
      — Tree structure
+ Ready!
  − Design
```

. . . and so on. The sub-headings are denoted by indents, and the 'level' of a heading by the number of indents. So, a sub-sub-heading would be indented twice. The plus sign indicates that a heading has sub-headings, the minus sign that it has none. In order to show the structure of the information, headings can be 'collapsed', so only the main heading is displayed; it's a useful way of taking out the fine detail in order to concentrate on the grand strategy, this being one of the principle benefits of outlining that distinguishes it from straight word processing.

Design

Ready! (the exclamation mark seems to be mandatory) is a co-resident version of ThinkTank; one that sits around in memory, on call to the user whenever needed. It can be loaded any time (usually when the system is booted up), and invoked from within an application program as well as at operating system level by pressing the 'hot key', which can be assigned by the user (the default is Ctrl-5). It will comfortably co-reside with other co-resident programs, like SideKick, though some are fussy about their location, and will only work if they are loaded in after Ready!.

In the memory map, Ready! is sandwiched between the resident portion of DOS and the program area, taking up a minimum of 112k, allowing 16k for outlines. Outlines of up to 32k can be stored by extending the memory available to 128k. In either case, you will probably need at least 256k of RAM to be able to exploit Ready!'s co-residency.

Give anyone who's used an outline processor a minute or two with Ready! and they'll see why co-residency is what outline processing has been waiting for. Being constantly within finger-tip reach, it's ideal for jotting down notes, or quickly preparing data for other applications, or shaping decisions (though saying it, or any sort of outline processor, is an aid to 'creative' thought is way over the top). At a fairly trivial level, it can be used as a diary and address book, or to compile do-lists; a daily summary of things to do. It includes an auto-dial facility, so you can run through a list of telephone numbers, calling them up with the press of a key. All you need is a Hayes or Hayes-compatible modem.

Ready!, however, is not simply a glorified jotter. It has a much bigger role to play. Its basic outlining system is identical to ThinkTank's. The trunk of the outline, to pursue the tree analogy, is the 'home' heading. As you would expect, there can only be one of these, which is normally used to describe the contents or purpose of the outline. The home heading is displayed at the top of the screen, and all the other headings are arranged beneath it. Entering other headings is simply a matter of pressing the 'Insert' key and typing them in. They are positioned with the cursor keys, being automatically treated as sub-headings of the previous heading if they

are indented.

Once an outline has been constructed, it is equally easy to move through, edit and organise it. Moving between headings is done using the cursor keys: up and down to move between headings at the same level; and left and right to move between levels. To expand a heading — that is display its sub-headings — you simply move to it and press the plus (+) key, and to contract it again, you press the minus (—) key.

To edit a headline, press 'E' and delete or insert text accordingly. To move a headline, type 'M' and use the cursor keys to reposition it; the heading moves with the cursor, so you can test moves out before fixing them. When you move a heading, all its sub-headings follow. Headings can be deleted, copied, 'hoisted' (moving them to the top and blanking out the rest of the outline), alphabetically sorted (in ascending and descending order), searched for keywords, in other words played around with in a host of different ways.

These instructions are performed either by using the cursor keys to select from a menu (invoked by pressing the F10 function key, and displayed in a five-line message area at the bottom of the screen) or with a single keystroke. Even better, Ready! will support a MicroSoft mouse, allowing the user to shoot the cursor around the outline as fast as a pin-ball.

So far, Ready! is more or less the same as ThinkTank, and in important respects superior to Brainstorm, because you can display headings at all levels at once, whereas Brainstorm will only display one level at a time, making it more difficult to manipulate the outline and get a general idea of its shape.

Here, however, Ready! starts to detach from its parent product. Firstly, some facilities have been taken out, so it takes up less space in memory. Unlike ThinkTank, outlines can't be paged to disk; each one can only be as big as the memory available — up to 32k (ThinkTank outlines can be as big as four megabytes, depending on available disk space). This maximum can't be increased, even though IBM PC/ATs and compatibles will increasingly be packed with megabytes of memory. Nevertheless, 32k is adequate for the sorts of purposes Ready! should be put to; it's enough for several hundred headings.

Again to cut down on the memory it needs, Ready! does not have ThinkTank's document mode, which means that free-form text can't be attached to headings. Like Brainstorm, Ready! wraps words round to a new, automatically inserted heading if the line-width is exceeded. However, this raises problems, as the new heading is at the same level as the heading in which the text starts. This means the block of text can be arbitrarily split if you start to play around with the outline.

Ready! also lacks any facility for linking between headings. In both ThinkTank and Brainstorm, the same headings at different levels can be linked together (they're called 'clones' in ThinkTank), which is useful for generating outlines that aren't purely hierarchical.

Living Videotext has obviously put some hard thought into exploiting the benefits of co-residency. Replacing some of the more memory-greedy facilities of ThinkTank is an array of features that give it a purpose all of its own. The user-chummy author of the manual, one Adam Green (I'll be your guide to the wonderful world of Ready!, he writes at the start of the manual), says that he uses Ready! as a briefcase, and ThinkTank as a filing cabinet. If anything, that's underselling it (or overselling ThinkTank); Ready! is suitable for a completely different kind of work to ThinkTank; what might be called, to borrow an old DP term, data-prep.

As well as being able to move from Ready! to an application by flicking the hot key, outlines can be transferred (using the transfer key, default: Shift-Ctrl-5). On its own, this would be useful for inserting an outline into a word-processed document, but not much else. However, there's more to it than that. Ready! can transfer keystrokes as well as straight text. By including key words, or 'macros', set in curly brackets, an outline can actually control the application it's being transferred to.

For example, suppose you had a list of numbers jotted down in an outline that you wanted to transfer to a spreadsheet, you could include within the appropriate heading a series of keystrokes such as (Home), (Right Arrow), (Down Arrow) (the latter can be abbreviated to (Ra) and (Da)) to move the cursor in the spreadsheet to the required cell when the transfer is made.

The function of every key on the IBM PC and AT keyboard can be reproduced this way, including combinations such as (Alt, A), (Ctrl F1) and (Shift Prt Sc). You can also repeat a series of keystrokes by placing a number after the macro, as in (Right 10) to reproduce pressing the right arrow key 10 times.

In short, you can get the outline being transferred to pipe keyboard commands into the target application automatically. There's also a selection of macros to control the transfer itself. (Fast), (Slow) and (Very slow) ensure that it's done at a speed the application can cope with (300, 18 and nine character per second respectively). (Pause) stops the transfer, passing control to the keyboard, and (Delay >seconds<) will delay it for a specified number of seconds, or until a key is pressed. There are also special macros for Framework, which includes keystrokes that DOS won't recognise, and one for Sidekick, to invoke it from within an outline. The transfer is done from within the target application, rather than Ready!.

In order to tailor Ready! to particular applications, a number of 'Set-up' options are available. These link a

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Allows 15 metres of telephone extension cable to be neatly wound into a protable storage container. The reel sits on a squared off base and the reel has a handle to wind cable back on to it after use. No tangles - no mess! Ideal for the workshop, around the house, office pool etc

Cat. Y16013 **$24.95**

TELECOMMUNICATIONS AUSTRALIAN STYLE ADAPTOR CABLE

- Australian socket to plug/socket
- Length 10 metres

Cat. Y16015 **Normally $15.95**
$12.75

TELEPHONE ADAPTOR

- Australian plug to U.S. socket
- Length 10cm
- Cream colour cable

Cat. Y16026 **Normally $6.95**
SPECIAL, ONLY $5.55

TELEPHONE CURL CORD

- U.S. plug to U.S. plug
- Replacement hand set cord
- Length 4.5 metres
- Colours: cream, dark brown

Cat. Y16022 **Normally $7.95**
SPECIAL, ONLY $6.35

TELECOMMUNICATION PLUG TO 2 SOCKETS.

Ideal for modem connections

Cat. Y16014 ..... **Normally $12.95**
SPECIAL, ONLY $10.35

TELEPHONE EXTENSION CABLE

- U.S. plug to 2 U.S. sockets
- Length 10 metres

Cat. Y16028 **Normally $10.95**
SPECIAL, ONLY $8.75

TELECOMMUNICATION EXTENSION LEADS

Cat. Y16010 5m **$12.50**
Cat. Y16012 10m **$14.95**

TELECOMMUNICATIONS AUSTRALIAN TO U.S. ADAPTOR CABLE

- Australian socket to U.S plug.
- Length 5 metres

Cat. Y16017 **$7.95**

MICRODOT 5¼" DISKS

100% certified and error free guaranteed! Where else can you get 100% guaranteed disks at these prices?!

	1-9	10+
S/S Cat.C12440	**$17.95**	**$16.95**
D/S Cat.C12445	**$22.95**	**$19.95**

Bulk and Dealer inquiries welcome please phone (03) 543 2166

DELUXE 5¼" DISK STORAGE UNIT

Features...

- Diskette fan display system elevates the disks for easy identification and access.
- Lockable lid (2 keys supplied)
- Clear smoked plastic lid
- High impact plastic base
- 45 diskette capacity

Cat. C16050 **Normally $49.95**
SUPER SPECIAL, $24.95

BARGAINS!

FLOPPY DISKS GALORE!!

All prices per 10 disk boxes!

Our Cat. Number	Product's Code	Description	1-9 Boxes	10+ Boxes
XIDEX 3½" DISKS				
C12600	3012-3000	S/S	$69.95 (Normally $75.00)	$64.95
C12602	3022-3000	D/S	$99.95 (Normally $109)	$89.95
XIDEX 5¼" DISKS				
C12401	5012-1000	S/S D/D 40 track	$29.95 (Normally $37.50)	$28.95
C12410	5022-1000	D/S D/D 40 track	$36.95 (Normally $47.50)	$34.95
VERBATIM 3½" DISKS				
C12610	MF350	S/S D/D 80 tracks/135 TPI	$69.95	$64.95
C12612	MF360	D/S D/D 80 tracks/135 TPI	$89.95	$85.95
VERBATIM 5¼" DATALIFE DISKS				
C12501	MD525-01	S/S D/D soft sector 40 track	$27.95 (Normally $44.95)	$26.95
C12504	MD550-01	D/S D/D	$34.95 (Normally $49.95)	$33.95
C12505	MD550-10	D/S D/D 10 sectors 40 tracks	$61.20	$56.95
C12507	MD577-01	S/S D/D soft sectors 80 tracks	$61.20	$56.95
C12510	MD557-01	D/S D/D soft sectors 80 tracks	$75.60	$68.95
VERBATIM 5¼" VALULIFE DISKS				
C12421		S/S D/D	$22.95	$21.95
C12421		D/S D/D	$29.95	$26.95
VERBATIM HIGH DENSITY 5¼" DISKS				
C12520	MD/HD	D/S H/D soft sector	$99.95 (Normally $109.95)	$89.95
VERBATIM 8" DISKS				
C12811	DD34-4001	D/S D/D	$63.60	$57.50
C12814	DD34-4026	D/S D/D	$66.00	$59.95
HEAD CLEANER DISKS				
C12551		5¼	$14.95	$12.95
C12851		8	$14.95	$12.95

RS232 GENDER CHANGERS

Saves modifying or replacing non-mating RS232 cables by changing from male to female to male. All 25 pins wired straight through

Male to male: Cat. X15650
Female to female: Cat. X15652
Normally $19.95
SPECIAL, ONLY $15.95

CENTRONICS

Cat. No.	Description	Price
P12200	36 way plug IDC	$12.50
P12201	36 way skt IDC	$13.50
P12203	50 way plug IDC	$14.50
P12204	50 way skt IDC	$15.50
P12207	24 way solder plug	$12.90
P12210	36 way soldar plug	$ 9.50
P12211	36 way sldr line skt	$15.95
P12213	36 way sldr chss skt	$15.95

130W IBM COMPATIBLE SWITCH MODE POWER SUPPLY

DC output: +5/13A, -5V/0.5A +12V/4.5A -12V/0.5A
AC input: 240V AC +-15% 1.5A 47Hz - 63Hz

Cat. X11096 **$239**

RS232 MINI PATCH BOX

- Interface RS232 devices
- With male to female 25 pin inputs
- 25 leads with tinned end supplied
- Complete with instructions

Cat. X15654 **Normally $25.95**
SPECIAL, ONLY $20.75

APPLE* COMPATIBLE CARDS

Printer Card Cat. X17029	**$89**
Drive Card Cat. X17019	**$95**
80 Column Card Cat. X17025	**$109**
Speech Card Cat. X17009	**$69**
Music Card Cat. X17011	**$99**
Super Serial Cat. X17035	**$129**
RGB Card Cat. X17039	**$79**

IBM COMPATIBLE CARDS

Switchable 5 MHz / 8 MHz IBM* compatible motherboard.

Cat. X **$495**

MOTHER BOARD!
XT compatible mother boards, 8 slots, room for 256K RAM
Cat. X18020 **$295**

GAMES ADAPTOR CARD
Features 2 joystick ports.
Cat. X18019 **$49**

MULTIFUNCTION CARD
(384K RAM) Parallel, serial and game port. Plus battery backup clock.
Cat. X18013 **$329**

DISK CONTROLLER CARD
Controls 2 slimline drives
Cat. X18005 **$89**

HIGH RESOLUTION MONOCHROME GRAPHICS CARD
Give your IBM real graphics capability.
Cat. X18007 **$249**

512K RAM CARD
Including RAM Cat. X18015 **$299**
Excluding RAM Cat. X18016 **$129**

COMPUTER LEAD

- 25 pin "D" plug to 25 pin "D" plug (RS232) DIP switches in each plug allow many combinations of internal wiring, making this a truly universal lead.
- Mylar shielding against RF interference.
- Length 2 metres.

Cat. P19031 **Normally $59.95**
SPECIAL, ONLY $47.95

RAINBOW CABLE

Suitable for IDC connectors.

Cat.No.	Description	$/metre
W12714	28AWG 14W	**$1.80**
W12716	28AWG 16W	**$1.80**
W12720	28AWG 20W	**$2.20**
W12726	28AWG 26W	**$2.90**
W12734	28AWG 34W	**$3.60**
W12740	28AWG 40W	**$4.40**

RITRON (ZETA) DATASETTE

For data loading and saving, the Ritron Datasette suits most home computers and features tape counter, monitor function for audio varification and slide control for output level.

Cat. C14900 **Now only $24.95**
SAVE $10

SAVE!

INLINE SWITCHING BOX

- 25 pin "D" plug to 25 pin "D" socket (RS232)
- DIP switches allow easy switching of internal wiring.

Cat. P **Normally $32.95**
SPECIAL, ONLY $26.35

COMPUTER CASSETTES

Quality 20 minute tapes.
Cat. D11141

1-9	10+	100+
$1.00	**$0.90**	**$0.80**

METEX MULTIMETERS

These instruments are compact, rugged, battery operated, hand held 3½ digit multimeters. Dual-slope A-D converters use C-MOS technology for auto-zeroing, polarity selection and over-range indication. Full overload is provided.

Features...

- Push-button ON/OFF power switch.
- Single 30 position easy to use rotary switch for FUNCTION and RANGE selection.
- ½" high contrast LCD.
- Automatic over-range indication with the "1" displayed.
- Automatic polarity indication on DC ranges.
- All ranges fully protected plus Automatic "ZERO" of all ranges without short circuit except 200 ohm Range which shows "000 or 001".
- High Surge Voltage protection 1.5 KV-3 KV.
- Capacitance measurements to 1pF
- Diode tssting with 1 mA fixed currant.
- Audible Continuity Test.
- Transistor hFE Test.

SPECIFICATIONS
Maximum Display: 1999 counts 3½ digit type with automatic polarity indication.
Indicstion Method: LCD display.
Measuring Method: Dual-slope in A-D converter system.
Over-range Indication: "1" Figure only in the display.
Temperature Ranges: Operating 0-C to +40-C
Power Supply: one 9 volt battery (006P or FC-1 type of equivalent)

Cat. Q91540 **Normally $129**
SPECIAL $109

RANGE!

RS232 & 'D' TYPE SPECIALS

Part	Description	Cat.No.	Price
DE9S	9 pin Female	P10881	$1.75
DE9P	9 pin Male	P10880	$2.25
DE9C	9 pin cover	P10882	$1.95
DA15P	15 pin Mala	P10890	$2.10
DA15S	15 Female	P10891	$2.25
DA15C	15 pin cover	P10892	$1.15
DB25P	25 pin Male	P10900	$1.95
DB25S	25 Female	P10901	$2.95
DB25C	25 pin cover	P10902	$1.20

COMPUTER LEADS

CL2
- 9 pin 'D' plug to 9 pin 'D' plug
- All pins wired straight through (removable terminals)
- Length 1.5 metres

Cat. P19033 **$14.95**

CL3
- 9 pin 'D' plug to 9 pin 'D' plug
- All pins wired straight through (removable terminals)
- Length 3 metres

Cat. P19035 **$17.95**

CL5
- 9 pin 'D' plug to 9 pin 'D' socket
- All pins wired straight through (removable terminals)
- Length 3 metres

Cat. P19036 **$17.95**

CL7
- 15 pin 'D' plug to 15 pin 'D' plug
- All pins wired straight through (removable terminals)
- Length 3 matras

Cat. P19016 **$24.95**

CL8
- 15 pin 'D' plug to 15 pin 'D' socket
- All pins wired straight through (removable terminals)
- Length 3 metres

Cat. P19017 **$27.95**

CL10
- 25 pin 'D' plug to 25 pin 'D' plug
- Pins 1 through to 8 and 20 wired straight through (removable terminals)
- Length 1.5 metres

Cat. P19011 **$26.95**

CL11
- 25 pin 'D' plug to 25 pin 'D' plug
- Pins 1 through to 8 and 20 wired straight through (removable terminals)
- Length 3 metres

Cat. P19009 **$23.50**

CL12
- 25 pin 'D' plug to 25 pin 'D' plug
- Pins 1 through to 8 and 20 wired straight through (removable terminals)
- Length 7.5 metres

Cat. P19037 **$25.95**

CL13
- 25 pin 'D' plug to 25 pin 'D' socket
- Pins 1 through to 8 and 20 wired straight through (removable terminals)
- Length 3 metres

Cat. P19020 **$29.95**

CL21
- 25 pin 'D' plug to 25 pin 'D' plug
- All pins wired straight through (removable tarminals)
- Length 1.5 matres

Cat. P19007 **$33.95**

CL22
- 25 pin 'D' plug to 25 pin 'D' plug
- All pins wired straight through (removable terminals)
- Length 3 metres

Cat. P19008 **$41.95**

CL23
- 25 pin 'D' plug to 25 pin 'D' socket
- All pins wired straight through (removable terminals)
- Length 3 metres

Cat. P19012 **$42.50**

CL25
- 36 pin Centronics plug to 36 pin Centronics plug
- All pins wired straight through
- Length 2.13 metres

Cat. P19014 **$49.95**

CL27
- Apple II, IIe, II+, with parallel interface card
- Dual 10 pin (20 contacts) connector to Centronics 36 pin plug
- Length 2.4 metres

Cat. P19025 **$29.95**

CL28
- Apple III with universal parallel interface card
- Dual 10 pin (20 contacts) on Apple and to Centronics 36 pin plug
- Length 2.4 metres

Cat. P19026 **$29.95**

CL30
- Tandy II/12/16/16B/2000, with dual 17 pin female on computer end to Centronics 36 pin plug. (Equivalent to 26-1323)
- Length 2.4 metres

Cat. P19027 **$33.95**

CL31
- Tandy I/III/4/4P, with 34 pin edge connector on computer end to Centronics 36 pin plug. (Equivalent to 26-1401)
- Length 2.4 metres

Cat. P19028 **$37.95**

CL33
- IBM PC, XT and look-a-likes with 25 pin 'D' plug on computer end to Centronics 36 pin plug.
- Length 2.13 metres

Cat. P19029 **$44.95**

WE HAVE THE BEST MEMORY PRICES!

IC SPECIALS!

	1-9	10+	100+
4116	$3.95	$3.75	$3.50
4164	$2.95	$2.75	$2.50
2716	$5.90	$5.50	$5.50
2732	$6.25	$5.95	$5.50
2764	$6.25	$5.95	$5.00
27128	$6.95	$6.50	$6.25
6116	$2.95	$2.75	$2.50
41256	$6.95	$6.50	$6.00
6264	$6.50	$5.50	$5.25
27256	$11.50	$10.50	$10.00

WORLD MODEM CHIP

Cat. U21614 Normally $49.50

Save $20, SPECIAL $29.50

IC SPECIALS! 8000 SERIES

	1-9	10+
8085	4.50	3.50
8212	1.50	1.40
8216	1.50	1.40
8226	1.70	1.50
8243	4.50	3.90
8251	3.90	3.50
8253	3.50	3.30
8255	2.90	2.50
8257	3.50	3.10
8259	3.50	3.10
8279	3.50	3.10
2532	7.50	6.90
2764	5.50	5.10
27128	7.50	6.90
1488	.55	.45
1489	.55	.45

Erase your EPROMs quickly and safely. This unit is the cost effective solution to your problems. It will erase up to 9 x 24 pin devices in complete safety, in about 40 minutes (less for less chips).
Features include:

- Chip drawer has conductive foam pad
- Mains powered
- High UV intensity at chip surface ensures EPROMs are thoroughly erased
- Engineered to prevent UV exposure
- Dimensions 217 x 80 x 68mm

Cat. X14950 **$99.95**

SPECIAL, ONLY $89.95

NEW EPROM ERASER WITH TIMER! $129

ELECTRONIC CHESS MK10

- Streamline design tabletop chess.
- New 8 level program from beginners to experts.
- Ideal teacher or strong opponent.
- Turn on/off any time. One year memory.
- 1,000 hours play with 3AA batteries.
- Optional mains adaptor available.
- Take back moves, verify, solve problems to mate in 3 and beyond.
- Player vs. player mode, thinks on opponents time, built in opening library.
- Beginner to expert, Estimated 1,500 Elo.

MK10 offers so much for so little!

Cat. C30002 **$149**

TURBO 16K

This brand new chess computer sets new standards in user convenience, and beats 92% of all chess players with its powerful 16K program.

Features:

Instant response

- Solves mate in 10 movas
- Internal clock with 2 LCD displays
- Displays moves considered
- Thinks in opponent's time
- Takes back
- 17 Levels
- 2 Year memory
- Mains adaptor socket

Cat. C30010 **$295**

SUPERB KAITEC 180 C.P.S. PRINTER

Epson FX80 compatible, standard 80 column dot matrix, Near Letter Quality mode, and 3K buffer!

Cat. C20020 **Normally $525**

SPECIAL, ONLY $479

RS232 DATA SWITCH WITH TESTER

- 25 pin RS232 "D" connectors 2 in, 1 out or 1 in, 2 out.
- Ideal for 2 computers to one peripheral or 1 computer to 2 peripherals.
- No power required.
- Six dual coloured LED indicators showing certain flow status:
  T.D. Transmit Data
  R.D. Recieve Data
  R.T.S. Request To Send
  C.T.S. Clear To Send
  D.S.R. Data Set Ready
  D.T.R. Data Terminal Ready
- Housed in heavy duty metal cabinet.
- Size: 200(W)x68(H)x150(D)mm

Cat. X19110 **Normally $149**

SPECIAL, ONLY $129

CENTRONICS DATA SWITCH

- 36 pin gold plated female Centronics connectors.
- All other specs as for RS232 Data Switch with Tester.

Cat. X19115 **Normally $169**

SPECIAL, ONLY $149

JUKI PRINTER

Professional daisy wheel printer 18CPS full incremental mode Diablo 630 emulation. Large range of daisy wheels. 8K internal buffer available.

Cat. C20040 **Normally, $825**

SPECIAL, ONLY $795

COMPUTER PAPER

Quality paper at a low price! 2,500 sheets of 11 x 9½", 60 gsm bond paper.

Cat. C21001 **Normally $44.95**

SPECIAL $37.95

VALUE!

PHOENIX 5

Suits Apple, Commodore, even your VCR!

- Pal and R.G.B.
- Normal Resolution
- 13" CRT Dot Pitch 0.65mm
- Horiz. Resol. 320 TV lines
- Vert. Rasol. 560 TV lines
- Display Characters 1,000 Ch.(40x25)
- 16 Colours (Pal)
- Green text display

Cat. X14522 **Normally $499**

SPECIAL ONLY $379

"Limited stock, so be quick!"

APPLE* COMPATIBLE SLIMLINE DISK DRIVES

Japanese Chinon mechanism, compatible with 2E and 2 plus.

Cat. X19910 **Only $249**

Japanese Chinon mechanism.

Cat. X19901 Normally $225

NOW $195

(*Apple is a registered trade mark.)

IC STORAGE CASE

Electro static charge proof plastic IC case with conductive sponge. Dimensions: 75 x 130 x 19mm.

Cat. H10095 **NORMALLY $8.95**

SPECIAL, ONLY $7.95

RITRON 2 MONITORS

Stylish, swivel base monitor, available in amber or green.

Green Cat. X14506 **Normally $215**

Amber Cat. X14508 **Normally $219**

SPECIAL, ONLY $199

NEW INTRA HIGH RESOLUTION RGB COLOUR MONITOR!

Size: 14 inch
Sync. Horiz. Scan Freq: 15.75 KHz
Sync. Vert. Scan Freq: 50 Hz
Band width: 18 MHz
Resolution: 640 x 400 dots
Display Format: 80 x 25 Characters
Display Colours: 16 colours.
Input Connector: 9 pin D type

Cat. X14520 ..... **only $695**

NEW!

"IBM*AT STYLE" KEYBOARD

- 100% IBM* PC, XT compatible.
- low profile keyboard design,
- proper placement of shift keys with large key tops to suit professional typists
- 3 step height/angle adjustment.
- Cherry brand TS-M0001 19mm low profile switches, meet 30mm ergonomic requirement, and provide high performance and maximum reliability.
- Curl lead plugs straight into IBM* PC/XT
- Status displays, (3)

Just like the "real McCoy" only at a fraction of the price!

Cat. X12020 ..... **only $245**

MITSUBISHI MONITORS

Green Cat. X14514 **$209**

Amber Cat. X14516 **$219**

CENTRONICS GENDER CHANGER

- Female to Female.
- Saves modifying or replacing non-mating Centronics cables.
- All 36 pins wired straight through.

Cat. X15662 **$33.95**

MITSUBISHI DISK DRIVES

MF353 (3½" DRIVE)
Double sided, double density, 1 M/Byte unformatted, 80 track per side.
Cat. C11953 **$280**

M2896-63
Slimline 8" Disk Drive, Double sided Density No AC power required. 3ms track to track, 1.6 Mbytes unformatted, 77 track side 10s/su10 bit soft error rate.
Cat. C11916 **$795**
Case & Power Supply to suit
Cat. X11022 **$159**

M4854
Slimline 5¼" disk drive. Double sided, double density, 96 track/inch, 9621 bit/inch, 1.6Mbyte unformatted 3ms track to track access, 77 track/side.
Cat. C11904 **$375**
Case & Power Supply to suit.
Cat. X11011 **$109**

M4853
Slimline 5¼" disk drive, Double sided, double density, 1 Mbyte unformatted, 3ms track to track, 80 track/side, 5922 bits/inch.
Cat. C11903 **$295**

M4851
Slimline 5¼" disk drive. Double sided, double density 500K unformatted, 40 track/side. Steel band drive system.
Cat. C11901 **$249**
Case & Power Supply to suit
Cat. X11011 **$109**

M4855
Slimline 5¼" disk drive, double sided, double density, 96 track/inch. 2.0 Mbytes unformatted.
Cat. C11905 **$385**

XIDEX PRECISION SCREEN

Headachas, fatigue and tired eyes are a common complaint from users of CRT's. But studies have reported that the use of the Xidex Precision Screen, actually increases effeciency 20% while relieving eye strain, headaches and general fatigue.
Available in two sizes:
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IBM* COMPATIBLES from $799*

Incredible deals to suit everyone including special package deals!
*256K RAM, single drive, graphics, disk controller and printer cards. $799
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256K RAM: Colour Graphics, Disk Controller Card, 1 parallel port, 2 disk drives and 3 months warranty. **only $1,350**

640K RAM: Colour graphics, Multifunction Card, Disk Controller Card, 2 serial and 1 parallel ports, 2 disk drives and 3 months warranty. only $1,450

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IBM* AT COMPATIBLE!

- 6/8 MHz (switchable)
- 80286 CPU
- 8 slots
- 1 M/Byte main board
- 1.2 M/Byte Floppy disk drive
- 20 M/Byte Hard disk
- Colour graphics display card
- Floppy and Hard disk controller card
- Printer card and RS232
- 200W Power supply
- Keyboard
- Manual

All this for just $2,995

APPLE JOYSTICKS

Ideal for games or word processing. Fits most 6502 "compatible" computers.

Cat. C14200 **$34.95**

20 M/BYTE HARD DISK DRIVE FOR IBM* AND COMPATIBLES

Includes disk controller card.

Cat. X20010 ..... **$1,250**

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JOYSTICK FOR IBM

Features Selectable "Spring centering" or "free floating". Electrical trim adjustments on both axis. 360 degree cursor control

Cat. C14205 **$39.95**

SWIVEL BASE

Make life easier with these quality, swivel and tilt bases, complete with rubber fittings!

Cat. D11100 **$29.50**

ARGUS 726 ADJUSTABLE MAGNIFIER WITH LAMP

Absolutely perfect for close up work! Intricate PCB's, projects, etc will be a breeze under this superb, adjustable magnifying lamp.

- Magnifies 1.75 times
- 40 watt incandescent lamp
- 2 spring-balanced arms, extendable to 95cm
- Adjustable head for optimum viewing angle.
- Fantastic Value!!

Cat. **only $89**

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$500 plus	$12.50

This is for basic postage only. Comet Road freight, bulky and fragile items will be charged at different rates.

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Registered Post for orders over $200 included "free"!

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Errors and Omissions Excepted.

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(THIS MONTH ONLY)

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R.R.P. $249 ..... **Our price $189**

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WORDSTAR 2000 RRP $595 **Our price $419**

WORDSTAR PROFESSIONAL **Our price $439**

MICROSOFT WORD Top selling word processor with built in spelling checker.
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particular set of macros to an outline, to ensure that the transfer suits the target application. The Set-up parameters of the target application program are attached to an outline by selecting its name from the Set-up menu. These parameters are stored in a configuration file, which can be edited like any other outline (very neat and consistent; a sign of sound software design). The parameters allow macros to be sent at a particular time in the transfer: when it starts, at the beginning of each heading, every time a new level is entered, and so on. A set of 30 pre-written Set-up parameters for all the major software packages is supplied, which can be added to or edited as necessary. The only omission, which is an irritating one, is a facility to send particular macros when particular levels of an outline are transferred.

Not every circumstance in every application can be covered by using macros.

The configuration file also holds parameters for using Ready! itself; for specifying the hardware configuration, assigning the hot key, and setting preferences such as the time and date formats (you can enter a time and date stamp in an outline simply by pressing Alt-T and Alt-D respectively). All this makes the program flexible and, because the configuration is an outline like any other outline, easy to adapt.

Documentation

The documentation is concise and clear, if a little effusive at times. It contains a tutorial (entitled *A Day in the Life of Ready!*), and a comprehensive reference section. Example applications are given, and appendices contain clear guidelines on configurations. The examples are rather light-weight (for example, it shows you how to use Ready! to plan a holiday), and fail to demonstrate the package's real benefits. The manual hasn't been anglicised, but that seems to be standard practice.

Price

Ready! retails for approximately $125 and is available from leading computer suppliers. This is a reasonable, even generous, price for a sophisticated product.

Conclusion

It's hard to set the limits of Ready!'s use: new possibilities emerge almost all the time. Nevertheless, for someone who throws a lot of data at their computer during the day, and who has to collate and organise complex or unstructured thoughts and notes, the benefits would soon emerge. Its co-residency is a real asset, and for most users it is likely to prove of greater practical use than ThinkTank as a result.

END

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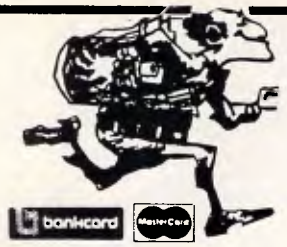

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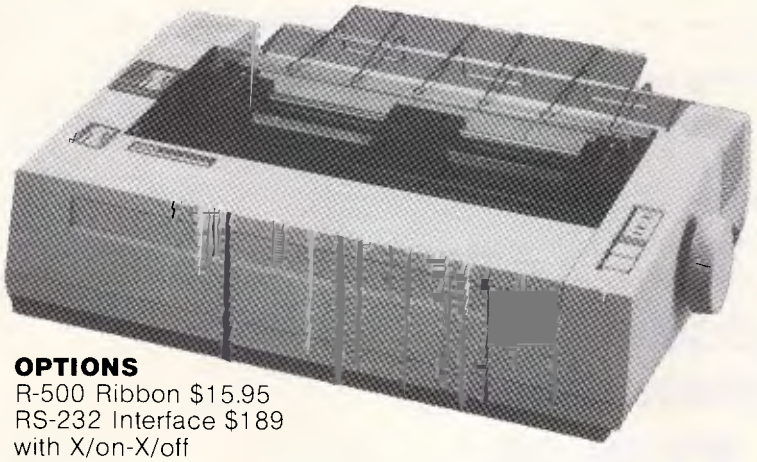

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LOGITEC FT-5002 FEATURES

Print Rate	120 cps (59 LPM)
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Print Direction	Bi-directional with logic seeking
Input Buffer	1 KB
Character set	Standard Mode 96 ASCII characters with descenders 11 semi graphics, 8 international characters Italic characters IBM-PC Matrix Printer Mode 96 ASCII characters with descenders 64 block characters, 9 international characters. IBM-PC Graphic Printer Mode Additional ASCII contain European, Graphic, selected characters, math and extra symbols.
Font Registraction	Up to 40 characters
Character Structure	9 x 9
Character Size	Ordinary characters 1.99(W) x 2.24(H) mm Superscript/ subscript characters 1.9(W) x 1.36(H) mm
Characters per line	Ordinary (pica/elite) 80/96 Double width elongated (pica/elite) 40/48 Compressed (pica/elite) 132/158 Compressed and elongated (pica/elite) 66/79 Superscript, subscript (pica/elite) 80/96
Paper Feed	Friction feed, Sprocket feed
Paper Width	Fanfold 4–10 inches Cut sheet 4–9 inches
Copies	3 max.
Interface	Standard Centronics-style 8 bit parallel Optional RS232C with 2K buffer (X/ON-X/OFF and ETX/ACK protocol)
Ink Ribbon	Cassette (Service life: 3 mil characters)
Head Service Life	Over 100 mil characters

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Character sets:	96 ASCII characters, 96 Italic ACSII characters, 32 International characters (11 countries), 64 Block Graphics, 132 IBM-PC™ special characters
Dot configuration:	3/254 inch (0.3 mm) dot diameter Draft (PICA) NLQ Dot alignment (Hor. x Ver.) 9 x 9 12 x 18 Dot pitch (Hor.) 1/120" (0.21 mm) 1/160" (0.16 mm) (Ver.) 1/72" (0.35 mm) 1/144" (0.18 mm)
Character size	
Ordinary characters:	0.078(W) x 0.095(H) in. (1.99 x 2.42 mm)
Superscript/subscript characters:	0.078(W) x 0.053(H) in. (1.99 x 1.36 mm)
Number of characters per line (per inch (25.4 mm)):	Pica (Draft, NLQ) 80 cpl (10 cpi) Elite (Draft, NLQ) 96 cpl (12 cpi) Compressed 137 pcl (17 cpi) Pica elongated 40 cpl (5 cpi) Elite elongated 48 cpl (6 cpi) Compressed elongated 68 cpl (8.5 cpi)
Printing speed:	Draft-Pica 180 cps Draft-Elite 180 cps Near Letter Quality 33 cps
Printing direction:	Text printing: Bi-directional Bit Image printing: Single direction (left to right)
New line time:	Approx. 100 msec [with 1/6 inch (4.2 mm) line feeding]
Paper feed:	Tractor feed (with fanfold paper) Friction feed (with single sheet)
Paper used:	Fanfold paper Width: 4-10 inches (102-254 mm) Thickness (paper weight in kg): 34-55 kg Single sheet Width: 4-9 inches (102-229 mm) Height: 5-14.3 inches (127-363 mm) Thickness (paper weight in kg): 34-70 kg (only 1 sheet)
Paper thickness:	1/100 in (0.25 mm) maximum
Copies:	Original and two copies
Storage environment:	-4°F (-20°C) to 140°F (60°C) temperature, 10-90% humidity
Operating environment:	41°F (5°C) to 104°F (40°C) temperature, 20-80% humidity
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Ribbon:	Cassette seamless fabric ribbon Service life: Approx. 3 million characters with draft character printing
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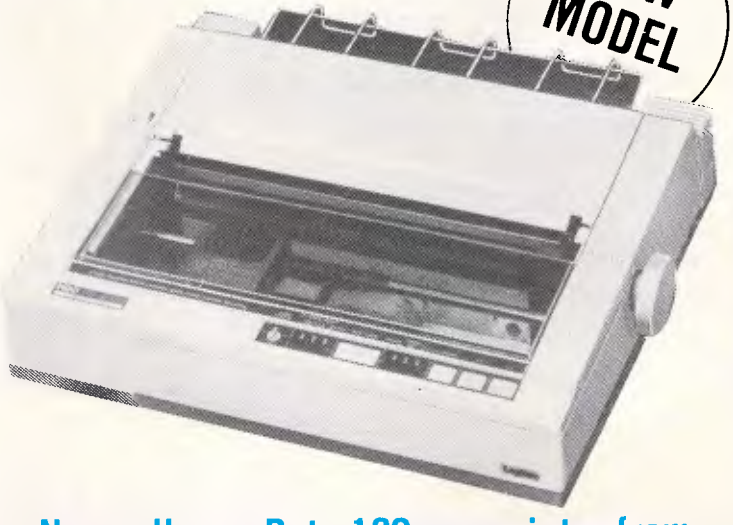

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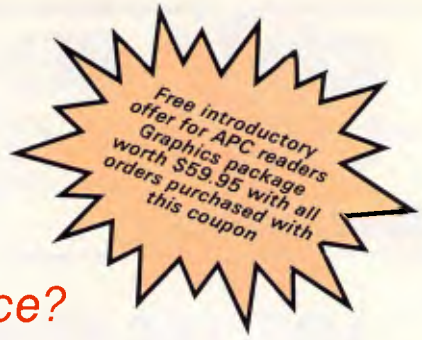


```
RD    READ "NAME: ",NAM,! QUIT:NAM="" 
      IF NAM'?2.A1","1A.E WRITE "PLEASE ENTER AS LAST,FIRST MI",! GO RD
TEL   READ "TEL # ",TEL,! IF TEL'?3N1"-"4N WRITE " NNN-NNNN PLEASE",! GO TEL
      SET ^DATA(NAM)=TEL GO RD
PRT   WRITE "      NAME",?20,"TELEPHONE #",! SET NAM=""
LP    SET NAM=$ORDER(^DATA(NAM)) QUIT:NAM=""  WRITE NAM,?20,^DATA(NAM),! GO LP
```

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In line 6, the $ORDER command gets the next subscript in order, from the ^DATA file, thereby SETting NAM to the next name in the file.

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Continued from page 96

does not reform paragraphs, nor is it possible to insert more characters into a line than there are spaces remaining at the end of the line. To crash the note pad, simply select the SETUP function and don't alter any of the parameters.

On to the more useful features. A menu generator is provided to assist the application builder. This utility allows multiple menus to be built and linked together, including security. Menus are executed using a single command, and cause other MUMPS programs to run depending on the user's selection. Menu items are selected either by using the cursor keys, space bar, or entering a short identifier. Additionally, a special 'programmer access code' can be specified which allows the menus to be broken out of.

In addition to the main menu manager, pop-up menus are also provided. These allow small windows to appear anywhere on the screen containing either messages or menus. Various highlighting and border options are supported. This feature is extremely easy to use, and incredibly powerful, but unlike other pop-up menu managers, does not restore the screen contents overlayed by the menu, resulting in clobbered displays unless the programmer designs his menus very carefully or takes responsibility for restoring the screen contents.

A screen painter is also provided which allows the programmer to interactively draw screens for later use. While not feature rich, the painter provides all the elementary functionality required, including four direction cursor movement and video attributes. Additionally, pressing the TAB key invokes a 'line mode' which allows the drawing of boxes and the like. This mode is really quite flakey, producing spurious characters on the screen, destroying other parts of the screen, and missing pieces of lines. It's a really neat idea — it even does the corners properly — it just doesn't seem to be entirely bug free yet. Finished screens are compiled into a MUMPS program, a procedure which takes a minute or so.

While the finished screen runs extremely quickly, the painter itself runs like a lame dog. To be fair, MUMPS was being run on a floppy based M24, and the incessant grinding of the disks did nothing to enhance the speed. Most users would run on a hard disk, and so the fits and starts would be greatly reduced.

Most screen painters allow the definition of input fields. In the MUMPS tool kit, this is done by a separate utility. Once a screen has been displayed, the program must make a series of calls to the final utility, TKREAD. This utility allows input to be taken from any set of screen co-ordinates, and includes features such as allowable character lists, maximum and minimum values, pattern validation, overtype editing of initial values, prompt text, terminators and maximum lengths. Upon return, TKREAD can tell the program which key was used to terminate the input, such as enter, up arrow, tab, and so on.

The screen painter and the input routine provide all the functionality required to produce full data entry screens. Unfortunately, in a very unweildy fashion. The two really don't fit together at all. The painter allows screens to be designed simply by running the cursor around the screen, yet to obtain data, absolute co-ordinates must be known and the programmer must manage the movement from field to field.

Despite its obvious shortcomings, the tool kit is a must for the serious MUMPS programmer. The licence agreement does not spell out arrangements for the use of tool kit generated software in packed systems. However, for $100, the tool kit can save mountains of time.

Conclusion

Mumps shows an interesting approach to implementing an integrated DBMS language. I believe the idea of removing any distinction between database operations and normal variable operations is a real winner.

However, Mumps itself is not very easy to use. It is not an end-user tool. It is not a fourth generation language. It is not commercially viable due to its many commissions.

Notwithstanding, it takes an excellent approach to multi-tasking and multi-user under MS-DOS. Although building a system in Mumps would be far more difficult than in any of the other DBMS systems around today, Mumps is virtually the only one which would yield a true multi-user system — and would probably do it at the lowest hardware and software costs. END

Mumps is available from MGlobal Australia, 261 George Street, Sydney. Telephone (02) 232 1732.

The single-user version retails for $279.95 and the multi-user version for $599.95.

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Kester Cranswick has been studying the list of exhibitors for the forthcoming PC86 Show at Melbourne's Exhibition Buildings. Here he presents his findings in APC's traditional Show preview.

Put on your most comfortable shoes, fatten up your wallet, leave the dishes in the sink and get on down to Melbourne's Royal Exhibition Buildings between June 1 and 4. There you will find the old, the new, the borrowed and Big Blue, showing off their goodies to ordinary folk like you and I.

That's the venue for (deep breath) the Seventh *Australian Personal Computer* Show, (PC86), Office Technology 86, Communications 86 and the Learning Show. It's also where the annual '86 PC Awards will be announced, and presented by the guru of Silicon Valley himself, Regis McKenna.

Some 150 companies will be represented, including IBM, Apple, Canon, Barson Computers, Commodore, Arcom Pacific, Imagineering, Olivetti, Telecom, Epson and Ericsson. The organisers expect in excess of 30,000 visitors.

Not every stand will have headline grabbing new products. For some, the Show is simply an opportunity to put on a public face and hopefully generate plenty of sales leads. For others, it is the chance to launch products in a venue where they can be guaranteed exposure and a large audience. But, with all the new products being launched, the competition for 'most talked about product' is fierce.

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PC 86

MELBOURNE 1-4 JUNE 1986

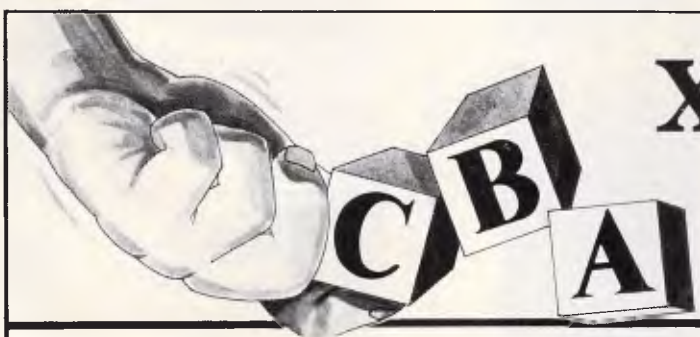
What to look for

Commodore is going to give it its best shot. It will be showing the already well known Amiga — the answer to the Macintosh. It will have professional musicians using the Amiga to generate some sort of melody above the chaotic noises of the Show, video camera digitizing visitors and cartoonists, artists and graphic designers trying to use the Amiga graphics to good effect.

But the real interest will be in the Amiga PC-emulator. This device will let the Amiga run PC software, and should answer any criticisms about a shortage of applications. Mind you, it is rather like using a Formula One racing car to commute.

Not to be outdone, Mobex is using the occasion to launch Atari back into Australia. In what will probably be the star attraction of the show, the Atari 1040ST will be making its debut.

For the uninitiated, the 1040ST is a machine with 1Mb of RAM, a 170k ROM, an internal double-sided, 3½inch 1Mb disk drive, a mouse and Basic, Logo, Gem and the TOS operating system. The cpu is a Motorola 68000 running at 8Mhz. The 1040ST has a high resolution PAL monitor, 14" colour with up to 16 colours, or 12"



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mono, with RF and composite video output too. There is a Midi interface plus word processing and graphics software.

What will stun the opposition, without a doubt, is the price. All that comes for $2,195 (mono), or $2,495 (colour). That is around $1,000 less than the originally anticipated price. The Amiga/Atari battle is on in earnest.

Mobex is also hoping to have a PC-emulator board for the 1040ST on show too. It will be interfacing the device to Casio synthesizers, via the Midi port, and will be showing about 100 software packages. It will also have a compact disk ROM device, with the Grollier encyclopedia on one CD.

There's more from Atari too. The junior version of the 1040ST will be on display. Called the 520ST, it has 500k of RAM, an external 500k disk and a price of $1,695. And there will be the home-orientated 130XE, on show for the first time. It has been lying dormant in the Atari catalogue for months, and comes in at $499. The 130XE boasts 128k of RAM and a 6502 processor. Well, it is a bit better than the VCS2600 games machine.

Yet another non-PC will be emulating the IBM micro. Gametronics will have a prototype card for the BBC Master that contains an 8086 processor, 512k of RAM and runs PC-DOS, MS-DOS and CP/M-86. It might just get the BBC out of the classroom.

If you think you are better off sticking with PCs that don't pretend to be other things, there are at least a dozen new clones to look at.

'Multidos enables up to six dumb terminals to be slaved off a single PC.'

Barson Computers will be showing the five Tandon micros. The range consists of two PC/AT compatibles, with either a 20Mb or 30Mb hard disk, and three XT compatibles, with a choice of 10Mb, 20Mb hard disk or twin 5¼inch, 360k floppies.

Assco will have five new clones on show, with the brand name Ergo. Made in Hong Kong, the range is two

Regis McKenna, in Australia to present the '86 PC Awards, among other things.

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They're compatible. Switchable to IBM or Epson with Centronics 8 bit interface or optional RS 232 serial.

They're versatile. With complete graphics capabilities for high resolution applications, eight print styles, and IBM character sets.

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- Windowing
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- Consistent command structure throughout
- Operational consistency
- Common data structure
- Free data movement
- Single product licence
- Translation facilities throughout
- System-wide configurability
- Two-way information piping

Word processing

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- Multi-column facility
- Cut and paste 24 ways
- Multiple cut and paste buffers
- Horizontal scrolling
- Headers, footers and margins
- Decimal tab/column align
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- Multi-user file locking
- On-screen multi-page help
- Automatic page numbering
- Noun-verb/direct command structure
- Auto-hyphenation
- Menu-driven integration
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- Standard letters/mailshot facility
- Automatic page breaks visible
- Command repeat/undo
- Global/interactive search/replace
- Automatic spelling check/correct
- Full document scrolling
- Paragraph/document merge/boilerplate
- Defineable macros
- Automatic paragraph numbering
- Internal calculator

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- Custom forms
- Powerful Report Writer
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- Optimised queries
- Integrated data dictionary
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- Controlled validation
- Multiple page forms
- Full screen administrator facilities
- Full operator prompting
- Hierarchical forms
- Unlimited records
- Help/assistance system
- Query history editing
- Multiple verb definition
- Keyword/message translation
- Security systems
- Interactive spreadsheet integration
- Pre-defined query storage
- Informix compatible

Spreadsheet

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- Macro programming language
- Integrated business graphics
- Windowing
- Labels
- Row/column titles
- Column width manipulation
- Absolute/relative addressing
- Command saving in text form
- Fast spreadsheet save/recall
- Command line editing
- Separate data/logic
- 1,000 rows x 1,000 columns
- Natural/row/column calculation
- Decision logic
- Output formatting control
- External data capture/output
- Prompted operator data capture
- Optional single key commands
- Interactive integration control
- Embedded database unix cells
- Linked spreadsheets

Graphics

- Business graphics capability from low cost screens
- Bar/line/scatter charts
- Mixed text/data/graphics on screen
- What you see is what you get
- Output on laser/matrix/LQ printers
- Colour supported

Menu system

- Integrate spreadsheet
- Integrate database
- Point and pick option selection
- Pass a filename to a Unix command
- Remark in menu
- Fetch user data for command
- Run a Unix command
- Define a user prompt
- Restructured menu layout
- Multi-columning
- Concatenate options
- Softkeys
- Boxing
- Text lines
- Document folios
- Multi-level menu structure
- Help on any subject

Screen builder

- Compiler syntax checker
- Response mapping
- Comprehensive error checker
- Input validation to order
- Default values
- Form security
- Alpha/numeric/general input classes
- File/directory/executable checking
- Abandon/execute functions
- Individual prompts on fields
- Parameter passing
- Screen appearance definable
- One of a range/type
- Full cursor control and editing
- Over 75 fields possible
- Mandatory input
- Field/form reset
- Scrolling default values
- Limit definition/checking
- Protected fields
- Inter-field comparison
- Multi-paging
- Definable variables
- On-line help and assistance

Calendar management

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- Shared diaries
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- Time scheduling/multiple booking
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- Alarm suspend/resume
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- User aliasing
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- Activity logging system
- Page control during read
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- Shows video effects
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Uniplex II Plus is now available on the IBM PC/AT, Xenix System 5 and the AT & T 3B series of computers

AT compatibles (Macro-AT and Super AT) and three XT compatibles (Macro-88, Turbo and Super-Turbo). Their best feature is a competitive price.

Epson is launching its AT compatible, the PC+. Priced at under $5,000, it has a new NEC 8086 cpu, dubbed the V30, switchable clock speed (4.77 or 7.16Mhz), 640k of RAM, auto power on and off, five expansion slots, serial and parallel ports and colour or mono graphics. It comes with Basic and MS-DOS.

MicroBee will be revealing at least two PC and PC/AT clones, with a graphics-based user interface.

Finally, in the PC field, there will be two new laptops. From Chendai, the Lap has a backlit LCD display which uses new LCD technology to give it a bigger contrast range and a wider viewing angle. It is AT compatible and comes with a choice of either two 5¼inch floppy disks or, believe it or not, a single 5¼inch disk and a 20Mb hard disk. The cpu is an Intel 80186 and there is 640k of RAM.

For the budget conscious, the Pulsar laptop, from Pulsar Electronics, is a PC-compatible with 512k of RAM, a single 3½inch disk drive, backlit LCD display and a carry case for less than $2,000.

Add-ons

There will be peripherals aplenty for the PC market too. Perhaps the most interesting development is the arrival in Australia of hard disks on cards. Barson Computers has a 21Mb hard disk that fits an expansion slot of a PC or compatible. Called the Business Card 21, it is made by Tandon, and will sell for less than $2000, including an on-board disk controller.

Imagineering has the Mountain 20Mb hard disk Drivecard and Adaptive Electronics has another 20Mb hard disk card under the Tandon brand name. With Barson distributing Tandon micros, and Adaptive, Tandon hard disks, it gets a little confusing.

Gametronics will be launching a speed card for the PC/XT, an 8Mhz card that doubles the processor speed. It will also have a 132 column display card for the PC/XT.

Alpha Technologies is showing, for the first time, Multidos, a hard disk device which enables up to six dumb terminals to be slaved off a single PC. It is Australian made and supports both MS-DOS and CP/M. A new mouse for the PC will be unveiled by Arcom Pacific. Called the Telepaint/Manager Mouse, it can work on a vertical surface and can be configured with macros for the buttons.

Canon will be demonstrating an optical character recognition device for its A200 and A300 micros, while Imagineering will have a short modem card for the PC that is smart and has all popular baud rates. Another new modem will be launched by Pulsar Electronics. It is intelligent too, with 300, 1200 and 1200/75 baud rates, dial back security and an attractive price of $750 all in.

Macintosh owners might be feeling a little left out at this stage. Fear not — Symbiotic Computer Systems will be launching the 20Mb Hyperdrive 2000, with a price of around $6,000, the Accelerator Card, a co-processor for up to 12 times faster number crunching, and a fan-aided surge suppressor with the unforgettable name of Fanny Mac.

New monitors from Taxan and Eizo will be showing their colours. The Taxan releases are the colour high resolution Super Vision IV and medium resolution IVM, KX-1222 Green and KX-1223 Amber. Taxan also has two new colour graphics cards, one short and one with an 8k second character set option, and a CD ROM drive, the DRD 530, which sits in a PC. It has 560Mb of ROM and an average seek time of 0.3 seconds.

And the soft side

Life is not all about hardware though. There will be new software to see. From Arcom Pacific, there will be a crowd stopper for the intelligentsia called Turbo Prolog. This is an artificial

PC TEX TYPESETTING PROGRAM

FOR IBM PCS AND COMPATIBLES

What is TEX?

TEX is a comprehensive typesetting program which has been running on mainframe computers since 1978. It is now available from THE WORDWORKS to run on the IBM PC, PC-compatibles and other MS DOS machines. (Incidentally, TEX is pronounced 'teck'. That's because the 'X' is really the Greek letter *chi*.)

What Kind of Typesetting Can TEX do?

Anything from complex scientific textbooks ($\int_1^x \frac{dt}{t} = \ln x$) to wedding announcements to multi-column newspaper layouts.[1]

What Hardware Is Required to Run TEX?

An IBM PC or compatible with a 10 (a squeeze!) or 20 megabyte hard disk and 512K or (preferably) 640K of RAM. THE WORDWORKS will happily supply these items.

What Kind of Printers Does TEX Support?

It gives true typesetting quality on the IMPACT 800-II LASER PRINTER, or on a Hewlett-Packard Laserjet printer upgraded with an IMPACT board from THE WORDWORKS. *(This ad was typeset with TEX and an IMPACT LASER PRINTER.)*

It gives quite good (e.g., club newsletter) quality output on the TOSHIBA 1340 & 1351 24-pin dot matrix printers; and does a reasonable job with Epson MX/FX or compatible printers. However, with matrix printers character-borders are faintly 'dotty'.

Is TEX Hard to Learn?

Learning the functional basics of TEX is no harder than learning a good word processing program. Beyond that you can go as complex as you like—TEX is a very powerful and versatile tool.

Is TEX a Word Processing Program?

No. You use a normal word processing program for preparing your text; then you convert your text files into standard ASCII files (most good wp programs allow you to do this easily); after which you process these ASCII files with the TEX program, and get a DVI (i.e., Device Independent) file. Finally you send this DVI file to your printer. (TEX files can be transferred between mainframe computers and PCs for editing or printing.)

Can One View One's TEX Output on Screen As It Will Appear on Paper?

Yes, with the optional PREVIEW program—provided you have a Hercules graphics card or equivalent and a 720x400 pixel monitor. THE WORDWORKS can provide these.

PC TEX $450

Printer Drivers: Epson FX/RX **$175**; Epson LQ1500 **$175**; Toshiba 1340/1351 **$175**; Impact Laser 800 Printer—**POA.**

[1]By the way, TEX does automatic footnotes, indexes and tables of contents.

THE WORDWORKS, The Boulevard Lawns, City Walk, Canberra City ACT 2601. Telephone (062) 572893; (062) 477739.

intelligence language for the PC. Arcom Pacific will also have Supercalc 3a, as Supercalc, but for the Apple, and SuperProject Plus, an improved version of SuperProject with the ability to schedule with limiting resources.

The other software giant, Imagineering, will be releasing Harvard Presentation Graphics, a package with 17 fonts, 16 colours and able to generate 35mm slides, overhead transparencies and the like; Report Writer; a Lotus accessory; and ChartStar, from the WordStar family. SCA will be demonstrating the PC version of Page Maker, called Personal Publisher. Now PC owners can generate their own advertising flyers and magazines, in the privacy of their own room.

Integrity Business Software is launching Breakaway, a software product which provides data transfer between the IBS accounting products and rival packages; and Manufacturing, an integrated manufacturing system for the PC with job costing, bill of materials, work in progress and inventory modules in the one system.

PCExpress is the name of a fabulous, but expensive, multi-dimensional, relational database from Iraus. It would be shorter to say what it can't do, but it is intended to act as a decision support system, with analysis, report writing, graphic, mathematic and statistical features. It also allows data to be transferred to and from packages such as Lotus, and the PC to act as a mainframe terminal. The only drawback is the $3,000 price tag.

Other than PCs

Strolling over to the Communications 86 section of the exhibition will give you access to yet more new products, all in the data communications field.

Australian Tel-Tec will be demonstrating the QDF Distribution Frame Block, a device that quickly connects telephone exchange and PABX applications. It will also have a fibre optic distribution panel, for connecting internal and external fibre optic links.

Motorola Communications will have a high tech gadget on show for the first time. It is the Syntrx, a third generation, synthesized mobile radio. It has been awarded an Australian Design Award, so it looks and sounds good.

Facsimile is a key component of communications, and NEC Australia will be unveiling two new facsimile machines. The Nefax-D35 is the first Group 4 facsimile device in Australia, and transmits an A4 document in three seconds. Group Four means that it can be integrated to normal digital data transmission networks. NEC will also have the portable Nefax-11 on show.

PABX is something many companies are now installing, and Communications 86 will have its crop of new devices. Plessey Communications Systems will be demonstrating its ISDX digital telephone system and ISDT digital telephone, while the Telephone Supply Company will have two new Philips PABX telephones.

The last part of the exhibition is Office Technology 86. Here the visitor can find photocopiers, typewriters, facsimile machines and workstations.

Two similar products that are quite unusual will be launched by Canon and Copispec. The Canon Electronic White Board and Copispec TEC Meeting Board are both large drawing boards which have the ability to transmit what is drawn on them digitally to another board, or a PC. A board of information can be stored to disk, or sent to a

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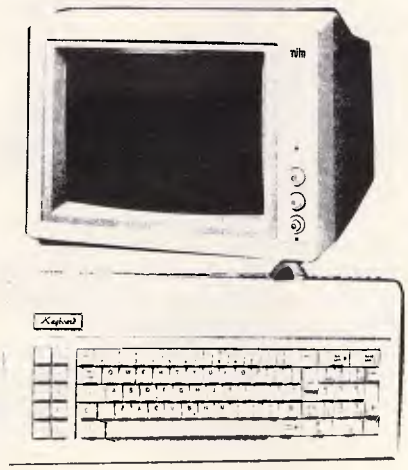
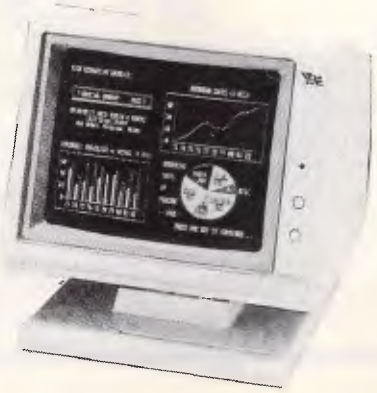
IBM XT compatible computer (GCS), 16 bit, 8 slots expandable to 640K, 8088, MP, 8087 optional, serial, parallel, game ports, colaour graphics board, clock, 640K RAM, 1 FDD, $1300. 2 FDD, $1450. 2 FDD.

Printers
Bidirectional printing logic-seeking programmable CPA 80 clmn 100cps - $397.50; CPB 80 clmn 130cps - $397.50; CPB 136 clmn, 130cps - $797.50



IBM & Apple compatible FDD (Shinon, Teac or Sanyo), 80 trac d/s d/d $235; 40 trac s/s s/d $220; HDD 5¼ (NEC, Teac) 10Mb $840; 20Mb $1120; 40Mb $1900; HDD controller DTC5150BX $340



Monitors
Monochrome swivel base 12" composite video, green or amber 20MHz $170; Monochrome swivel base 12" TTL high-res graphic, amber 20MHz $197; Colour RGB 14" switchable to green or amber, resolution 720x480 with interlaced definition 0.31mm dot trio pitch $697.

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PREVIEW

PC 86

remote location.

A new laser printer, the Opus 2, will be on show at the Ectron stand. It prints eight pages per minute and has a 300 x 300 dot per square inch resolution. You'll probably hear the other Ectron new release, a series of digitized voice systems. The Delta Maxi 10 gives up to 10 minutes of speech in ROM or RAM. Speech can be customised for particular requirements.

Datamaster is a micro device which gathers and processes data about employee attendance times and job costing. The agents, Creswick Industries, see it eliminating the manual time clocks and manual records.

They had better not rig it up to the turnstyles: it would probably get overloaded. Despite the huge number of shows, all offering opportunities for new product launches, PC86 is going to have the best range of new products to capture the attention of the visitor. END

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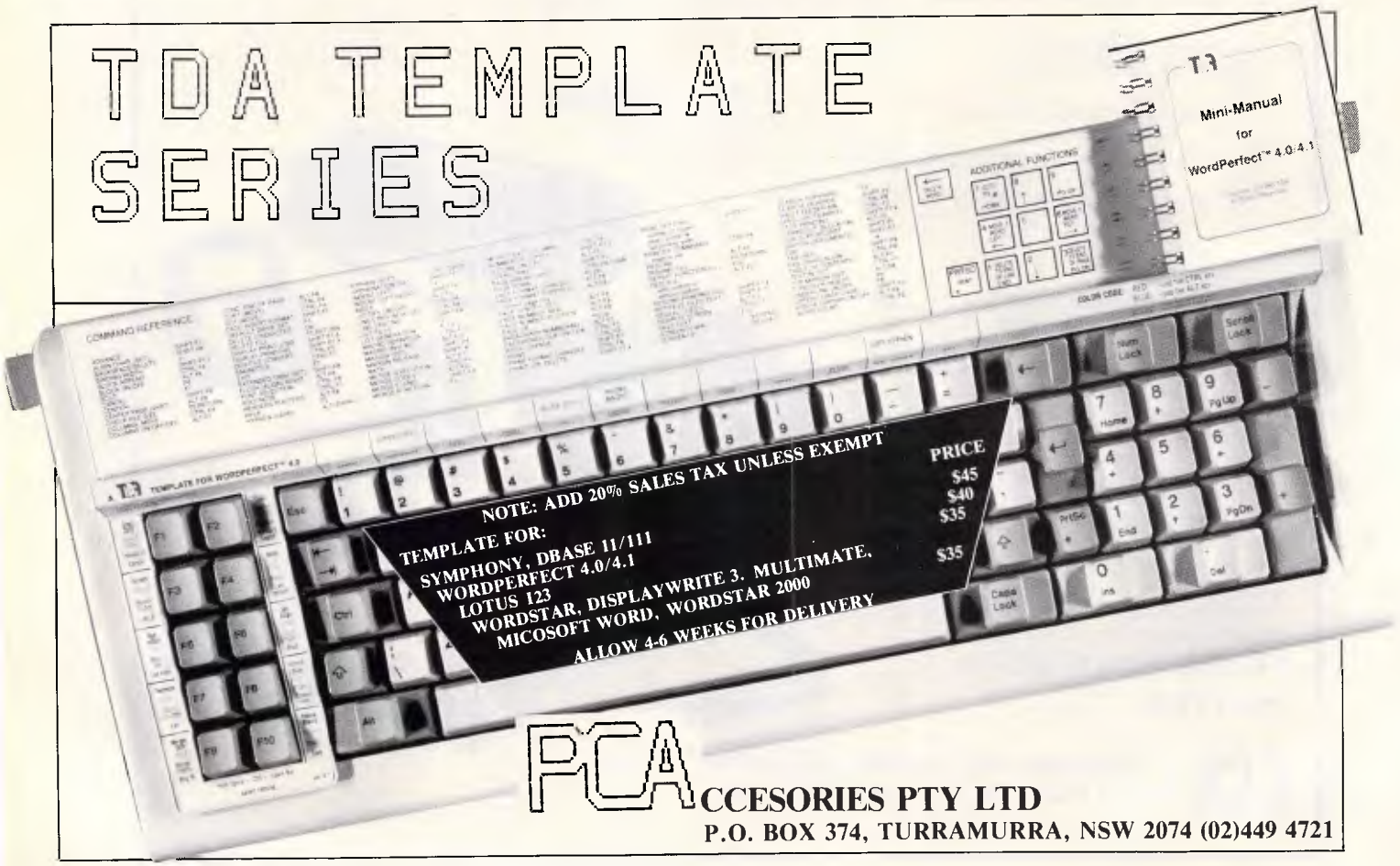

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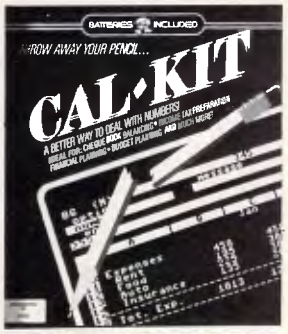

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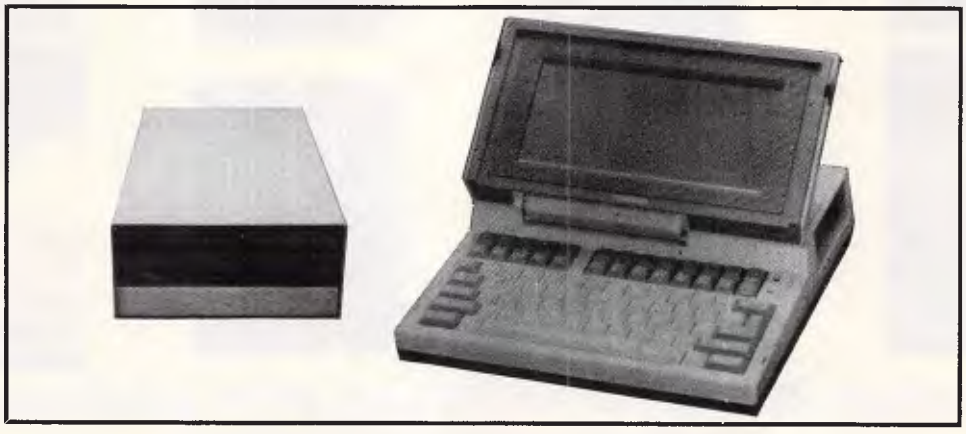

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Come out of your shell

If you consider yourself to be an expert on a particular subject, why not give others the benefit of your knowledge by creating an expert system? Sergio Vaghi presents an example of DOS as an expert system shell which contains many useful characteristics.

Many specialised domains of knowledge can be represented in the form of structured decision trees such as the one shown in Fig 1. Examples vary from the expert knowledge needed for the classification or identification of objects, from plants and animals to certain types of medical consultations, from fault diagnosis in complex machines to investment advice, and from simple games to the selection of mathematical routines from a software library. Tree-structured expert knowledge can then be used as the basis of an expert system (ES) (see also 'Playing by the rules' by Ed Stenson, *APC*, November 1985 for a method to build decision trees).

If you plan to develop an expert system of this type, or simply wish to gain experience in this area of artificial intelligence (AI), this article will help you.

When you have organised the expert knowledge, you are confronted with the problem of translating it into computerised form. Two main alternatives currently exist: coding the knowledge base in an AI language such as Lisp or Prolog (although in certain cases a procedural language can also be suitable); or using a generic mechanism of inference, a so-called expert system shell. The first approach requires, of course, that you know the language in question. Learning it may or may not be worth the effort, depending on your application and on whether you intend to write many expert systems in future.

Expert system shells are programs which are commercially available and can be used in different ES applications, provided that the knowledge base is coded with a structure and syntax understandable by the shell. Structure and syntax are kept very simple, so that even someone with no programming experience can easily write the code.

Shells can be written in high-level languages such as Pascal and Fortran, or even in Basic; their prices range from less than $100 to well above $2000.

Strategy
s0 — (No suitable strategy available)
s1 — Call purchase
s2 — Synthetic long stock
s3 — Bull spread
s4 — Protected stock purchase
s5 — Bullish call calendar spread
s6 — Covered call writing
s7 — Uncovered put writing

Table 1 Option strategies (subset)

Questions
q1 — Are you bullish, bearish or neutral on the stock?
q2 — Risk you are ready to take (limited/large/unlimited)?
q3 — What is the reward you are after (limited/large/unlimited)?
q4 — Do you prefer a position including the stock (yes/no)?
q5 — Do you prefer to take a spread position (yes/no)?

Table 2 List of questions (subset)

The source code is not always included and you will use the shell as a black box attached to your knowledge base — a rather unsatisfactory situation.

If you use a PC running under PC-DOS/MS-DOS (DOS for short), version

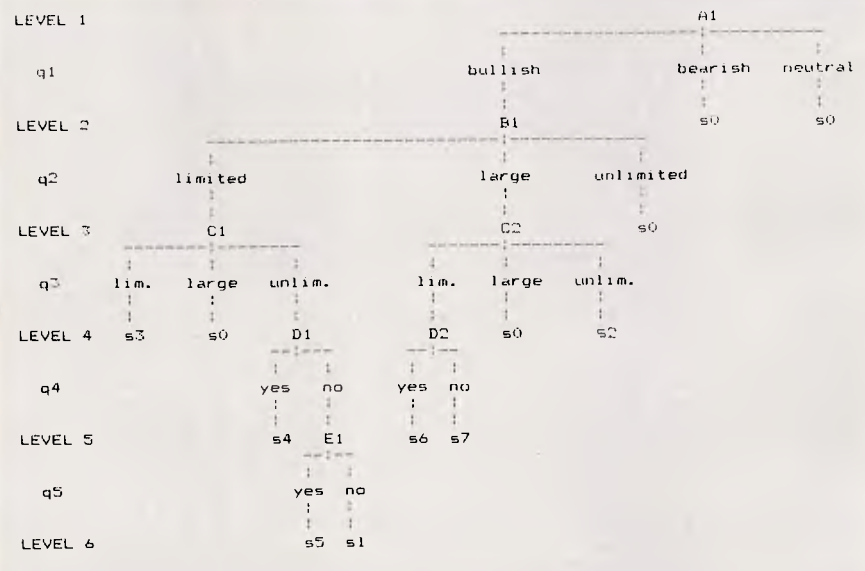

Fig 1 OS-ES knowledge tree (subset)

```
ECHO OFF
CLS
REM ---------------------------------------------------------------
REM                        start.bat
REM ---------------------------------------------------------------
ECHO .
ECHO            OPTION  STRATEGIES - EXPERT  SYSTEM
ECHO                    ver. 0.00  (subset)
ECHO .
ECHO                Copyright 1986 by S.Vaghi
ECHO .
PAUSE
IF EXIST facts DEL facts
kb ?
REM ---------------------------------------------------------------

ECHO OFF
CLS
REM ---------------------------------------------------------------
REM                              kb.bat
REM ---------------------------------------------------------------
REM
REM
REM                              RULES
REM                              -----
REM
REM ..... level 1
REM
:a1
       IF %1 == bullish GOTO b1
       IF %1 == bearish GOTO s0
       IF %1 == neutral GOTO s0
       ECHO %0 %%1 ? > $.bat
       GOTO q1
REM
REM .....level 2
REM
:b1
         IF %2 == limited GOTO c1
         IF %2 == large GOTO c2
         IF %2 == unlimited GOTO s0
         ECHO %0 %1 %%1 ? > $.bat
         GOTO q2
REM
REM ..... level 3
REM
:c1
              IF %3 == limited GOTO s3
              IF %3 == large GOTO s0
              IF %3 == unlimited GOTO d1
              ECHO %0 %1 %2 %%1 ? > $.bat
              GOTO q3
REM
:c2
              IF %3 == limited GOTO d2
              IF %3 == large GOTO s0
              IF %3 == unlimited GOTO s2
              ECHO %0 %1 %2 %%1 ? > $.bat
              GOTO q3
REM
REM .....level 4
REM
:d1
                 IF %4 == yes GOTO s4
                 IF %4 == no GOTO e1
                 ECHO %0 %1 %2 %3 %%1 ? > $.bat
                 GOTO q4
REM
:d2
                 IF %4 == yes GOTO s6
                 IF %4 == no GOTO s7
                 ECHO %0 %1 %2 %3 %%1 ? > $.bat
                 GOTO q4
REM
REM .....level 5
REM
:e1
                    IF %5 == yes GOTO s5
                    IF %5 == no GOTO s1
                    ECHO %0 %1 %2 %3 %4 %%1 ? > $.bat
                    GOTO q5
REM
REM ---------------------------------------------------------------
REM
REM
REM
REM                              QUESTIONS
REM                              ---------
REM
REM
REM
:q1
       ECHO Are you bullish, bearish or neutral on the stock ? >> facts
       ECHO Are you bullish, bearish or neutral on the stock ?
       ppp
REM
:q2
       ECHO Risk you are ready to take (limited/large/unlimited) ? >> facts
       ECHO Risk you are ready to take (limited/large/unlimited) ?
       ppp
REM
:q3
       ECHO What is the reward you are after (limited/large/unlimited) ? >> facts
       ECHO What is the reward you are after (limited/large/unlimited) ?
       ppp
REM
:q4
       ECHO Do you prefer a position including the stock (yes/no) ? >> facts
       ECHO Do you prefer a position including the stock (yes/no) ?
       ppp
REM
:q5
       ECHO Do you prefer to take a spread position (yes/no) ? >> facts
       ECHO Do you prefer to take a spread position (yes/no) ?
       ppp
REM
REM
REM
REM ---------------------------------------------------------------
REM
REM
REM
REM                              SOLUTIONS
REM                              ---------
REM
REM
REM
REM
:s0
       rec [NO_SUITABLE_STRATEGY_AVAILABLE]
REM
:s1
       rec CALL_PURCHASE
REM
:s2
       rec SYNTHETIC_LONG_STOCK
REM
:s3
       rec BULL_SPREAD
REM
:s4
       rec PROTECTED_STOCK_PURCHASE
REM
:s5
       rec BULLISH_CALL_CALENDAR_SPREAD
REM
:s6
       rec COVERED_CALL_WRITING
REM
:s7
       rec UNCOVERED_PUT_WRITE
REM
REM
REM ---------------------------------------------------------------


ECHO OFF
PROMPT $G
REM ---------------------------------------------------------------
REM                        ppp.bat
REM ---------------------------------------------------------------




ECHO OFF
CLS
REM ---------------------------------------------------------------
REM  bullish.bat, bearish.bat, neutral.bat, limited.bat, large.bat,
REM  unlimited.bat, yes.bat, no.bat
REM ---------------------------------------------------------------
ECHO %0 >> facts
$ %0
REM ---------------------------------------------------------------
```

Fig 2 Listing of the files in OS-ES (subset)

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Fig 2 continued

```
ECHO OFF
CLS
REM ------------------------------------------------------------------------
REM                                rec.bat
REM ------------------------------------------------------------------------
REM
        ECHO                                                          >> journ
        ECHO          ************************************            >> journ
        ECHO                                                          >> journ
        ECHO                                                          >> journ
        ECHO                Record of the consultation                >> journ
        ECHO                ---------------------------               >> journ
        ECHO                                                          >> journ
        TYPE facts                                                    >> journ
        ECHO                                                          >> journ
        ECHO        Recommended strategy ..... %1                     >> journ
        ECHO                                                          >> journ
REM the following line contains the nonprintable character (Ctrl)g after ECHO
        ECHO 
        ECHO .
        ECHO        Recommended strategy ..... %1
        IF NOT %1 == [NO_SUITABLE_STRATEGY_AVAILABLE] GOTO lab1
        ECHO                                                          >> journ
        ECHO .
        ECHO .
        ECHO        If you want to backtrack to the previous node enter
        ECHO                              $
:lab1
        ECHO .
        ECHO .
        ECHO        The record of this consultation has been added to file
        ECHO                              journ
        ECHO .
        ECHO .
        ECHO        ---------- End of the consultation ----------
        PROMPT =
REM ------------------------------------------------------------------------
```

2.00 or later, you perhaps have a better alternative — using DOS itself as an expert system shell. It will be shown in this article that DOS can be used as an inference engine for expert systems based on deterministic, tree-structured knowledge, not directly involving numerical calculations. All you have to do is write the knowledge base using the simple syntax of the DOS batch files, which essentially amounts to the most direct form of structured English. It's simpler than Basic, and it comes 'bundled' with your machine.

DOS as an ES shell

The minimum that is required from an ES shell is the ability to perform conditional testing (of the type IF . . . THEN . . .), branching (of the type GOTO . . .), and input/output management suitable for interactive use of the program.

In DOS, conditional testing is provided by the batch sub-command IF [NOT] condition command, where the condition parameter is one of the following:
ERRORLEVEL number
string 1 = string 2
EXIST filespec
and command is any DOS command. NOT condition is true if condition is false.

Branching is performed by the GOTO label sub-command, which causes commands to be executed beginning with the line immediately following :label.

I/O management is rather more complex, if interactive use is desired. Output can easily be obtained by the sub-command ECHO [ON:OFF message]. ECHO message displays the string message onscreen and can thus serve for communication with the user. ECHO OFF inhibits screen display of the commands following it in the batch file, and can be used to avoid displaying useless messages onscreen.

Interactive input to a batch file requires, on the contrary, a programming trick, as the usual way to provide input to a DOS batch file is to pass the values of the replaceable parameters when the file is called. Dummy parameters — represented by the symbols %1 to %9 in the code — are replaced, at execution time, by the actual parameters which follow the name of the file when called. DOS does not offer the feature, present in the more powerful operating systems of minis and mainframes, of allowing the user to be prompted — during execution — for a missing parameter.

How this problem can be solved will be explained when I present an example of an expert system.

Other features of DOS used in the example are:
— the aforementioned possibility of transferring parameters to a batch file;
— I/O redirection with the TYPE command and ECHO sub-command, to direct text and messages to a file; and
— the DOS commands CLS, to clear the screen, and PROMPT, to change the prompt, which, with the PAUSE and REM sub-commands, will help in adding a cosmetic touch to the expert system.

Only a small number of internal DOS commands and batch sub-commands are needed in our example. All the other DOS commands can, however, be used and may prove helpful in certain applications.

Desirable features

An expert system should, first of all, be easy to write and maintain. I personally find Lisp and Prolog programs often hard to read, which also means they're difficult to debug and maintain, because errors can easily slip into the code and go undetected. A friendly interface with the user is also desirable. Interactive use is generally required, with reasonably efficient error-trapping for the less experienced or occasional user. A 'help' facility can be useful.

Backtracking — that is, the possibility of going back to the previous decision node — is also important as it allows the user who has reached the end of a limb to go one step back and choose a different path, without having to start the consultation from the beginning.

Another essential feature is the possibility of tracing and recording a consultation. This is invaluable during debugging of the program, and convenient for the user, who gets a complete record of the session.

Easy access to a database directly from the ES — for example, to provide a detailed description of a given recommendation — can also be handy in certain cases.

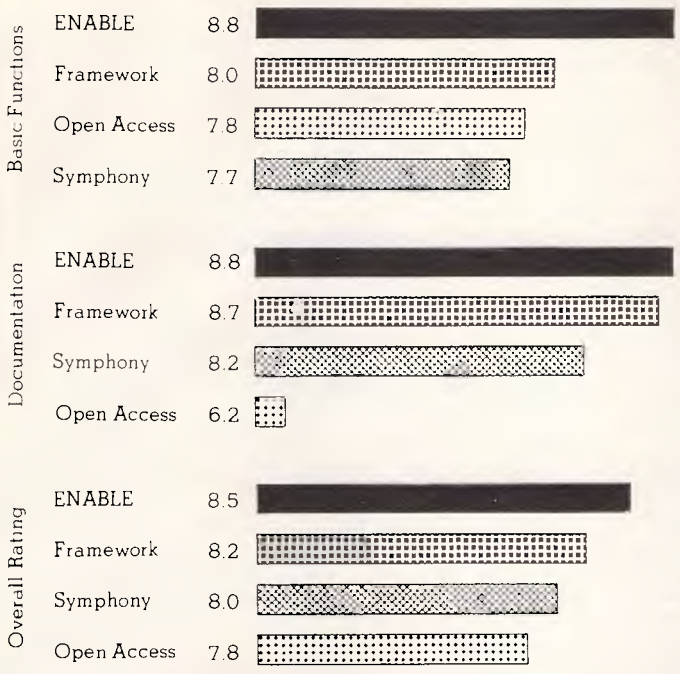
It may be appropriate to let the user ask, during the course of the session, why a certain question is asked, or how a certain conclusion has been reached. Depending on the application, 'how' and 'why' capabilities are often desirable and sometimes essential.

The example chosen for this article, and which will be completely developed to the point where you can run it on your PC, is a subset of a real expert system currently under alpha-testing.

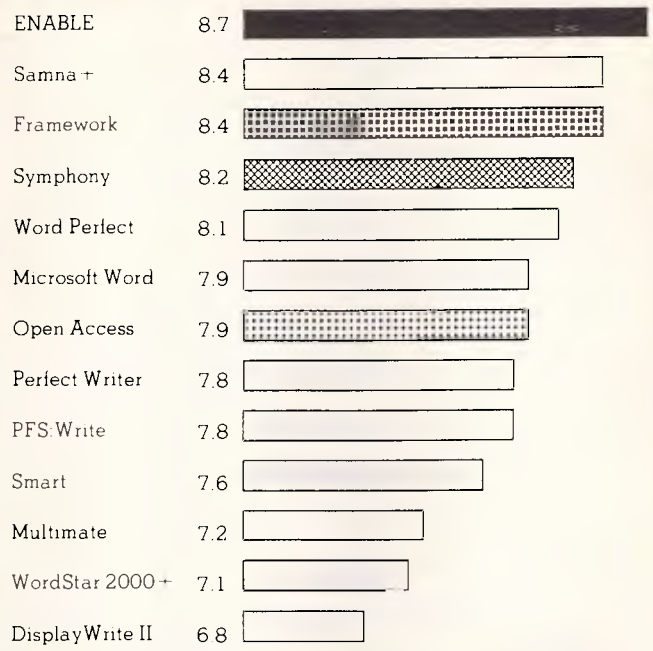
Option Strategies'-Expert System (OS-ES) provides investment advice in the area of listed stock options. Although this is perhaps a somewhat unfamiliar field to many *APC* readers, I have chosen OS-ES instead of the 'toy' expert systems so often found in academic literature — such as a fictitious psychiatric session or the 'twenty questions' game — to show that, within the limits spelled out later, you can indeed develop absolutely 'serious' and useful expert systems with DOS.

I'll briefly explain what OS-ES is about. Listed stock options are security contracts which give the right to buy (call option) or sell (put option) a given number of shares of the underlying stock for a fixed price within a limited period of time. Option contracts can be bought or sold in the exchanges, where they are listed in the same way that it is done for

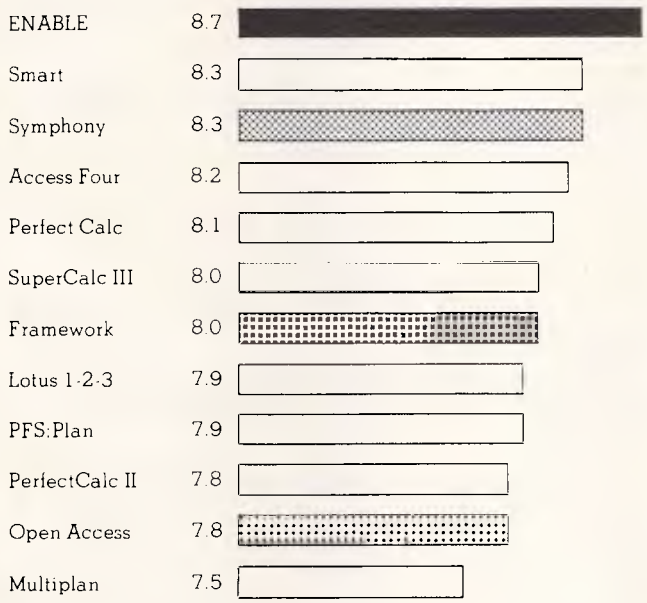
WHICH INTEGRATED PACKAGE?



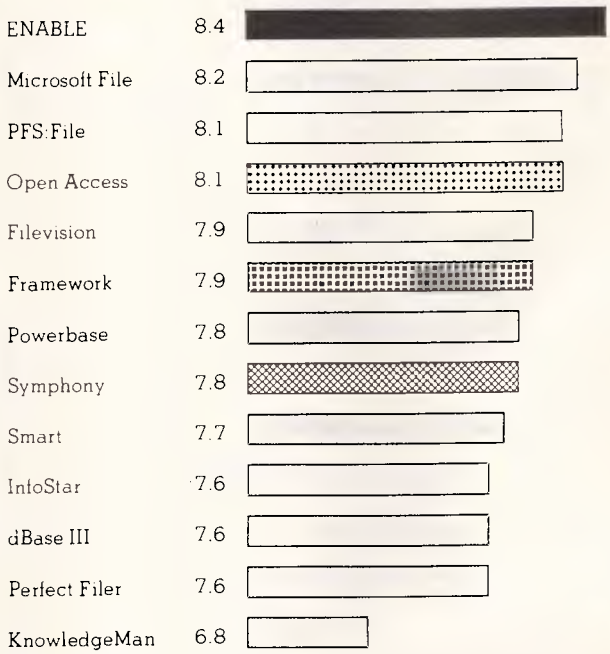
WHICH WORD PROCESSING PACKAGE?



WHICH SPREADSHEET PACKAGE?



WHICH DATA BASE PACKAGE?



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enable

```
C>start


          OPTION  STRATEGIES - EXPERT  SYSTEM
                 ver. 0.00  (subset)

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Strike a key when ready . . .
Are you bullish, bearish or neutral on the stock ?

 bullish

Risk you are ready to take (limited/large/unlimited) ?

>limited

What is the reward you are after (limited/large/unlimited) ?

>limited


       Recommended strategy ..... BULL_SPREAD

       The record of this consultation has been added to file
                          journ

     ---------- End of the consultation ----------

C>
```

Fig 3 Example of consultation as it appears onscreen

```
C>start


          OPTION  STRATEGIES - EXPERT  SYSTEM
                 ver. 0.00  (subset)

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Strike a key when ready . . .
Are you bullish, bearish or neutral on the stock ?

>bullish

Risk you are ready to take (limited/large/unlimited) ?

>large

What is the reward you are after (limited/large/unlimited) ?

>large


       Recommended strategy ..... (NO_SUITABLE_STRATEGY_AVAILABLE)

       If you want to backtrack to the previous node enter
                          $

       The record of this consultation has been added to file
                          journ
```

Fig 4 Example of consultation including backtracking

Fig 4 continued

```
     ---------- End of the consultation ----------

C>$


What is the reward you are after (limited/large/unlimited) ?

>unlimited


       Recommended strategy ..... SYNTHETIC_LONG_STOCK

       The record of this consultation has been added to file
                          journ

     ---------- End of the consultation ----------

C>
```

```
**************************************

          Record of the consultation
          --------------------------

Are you bullish, bearish or neutral on the stock ?
bullish
Risk you are ready to take (limited/large/unlimited) ?
limited
What is the reward you are after (limited/large/unlimited) ?
limited

       Recommended strategy ..... BULL_SPREAD

**************************************

          Record of the consultation
          --------------------------

Are you bullish, bearish or neutral on the stock ?
bullish
Risk you are ready to take (limited/large/unlimited) ?
large
What is the reward you are after (limited/large/unlimited) ?
large

       Recommended strategy ..... (NO_SUITABLE_STRATEGY_AVAILABLE)

**************************************

          Record of the consultation
          --------------------------

Are you bullish, bearish or neutral on the stock ?
bullish
Risk you are ready to take (limited/large/unlimited) ?
large
What is the reward you are after (limited/large/unlimited) ?
large
What is the reward you are after (limited/large/unlimited) ?
unlimited

       Recommended strategy ..... SYNTHETIC_LONG_STOCK
```

Fig 5 Printout of the file 'journ' with the record of the consultations

the shares of a stock. The attraction of options for many investors and portfolio managers is that they can be used, alone or in combination with the shares of the underlying stock, to implement various advanced investment strategies.

Considering that option strategies can be very complex and the money involved is often quite substantial, this is an ideal application field for expert systems.

OS-ES, of which the example given here is a subset, assists the investor in

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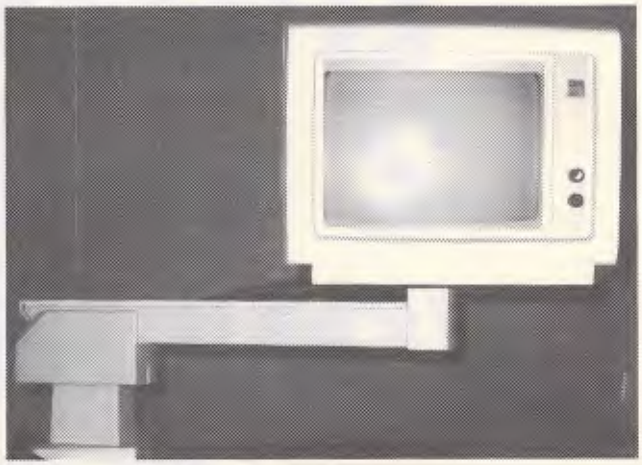

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the selection of a suitable option stragegy, depending on factors such as the attitude of the investor towards the stock, the risk he or she is prepared to accept, and others. Our subset of OS-ES covers the particular case in which the investor is 'bullish' on the stock — that is, he believes that the price of the stock will rise during the lifetime of the option. The complete expert system also includes the cases when the investor is 'bearish' on the stock — that is, he believes that the price will decline, or when he is neutral.

Here's a word of warning: as I have stated, OS-ES is, at the time of writing, still under testing, so if you do invest in options please refrain from using this subset for your investment decisions.

Writing the system

The knowledge base of our expert system is contained in Tables 1 and 2, and in Fig 1.

The option strategies considered are listed in Table 1. Each strategy is characterised by certain attributes: strategy s3 (bull spread) is, for example, suitable for an investor with a bullish attitude towards the stock, ready to take a limited risk only, and accepting a limited reward on the investment. These attributes are translated into answers to the relevant questions listed in Table 2. For the bull spread stragegy the answers to the first three questions are bullish, limited, limited. This, in turn, is reflected in the position of the strategy in the knowledge tree in Fig 1. The other ramifications of the tree are built up in the same way for the other strategies considered.

The tree itself consists of levels and nodes. The expert system reasons along paths, from one node to the other, asking questions whenever a piece of information is needed and then moving to the corresponding node at a deeper level, eventually reaching a solution: that is, a recommended option strategy (note that strategy s0 is included for the cases when no suitable strategy is available with the attributes specified by the user).

Following the sub-tree in Fig 1 it is possible to code the knowledge base as a DOS batch file, which I have called kb.bat. It consists of three sections — 'rules', 'questions' and 'solutions'.

We start at level one, node A1. The answer to the first question, q1, will correspond to the first dummy parameter, %1, in kb.bat. If %1 is equal to bullish, we move to node B1. If %1 is equal to bearish or neutral, the recommended solution will be 'no suitable strategy available', because only the 'bullish' sub-tree of the knowledge base is considered. If %1 is equal to none of the above, this means that either it is the first time that the ES has come to this node, or a 'non-acceptable' answer was entered. In either case, the program will prompt you for more information.

All this can be coded very simply:

```
:a1
    IF %1 = bullish GOTO b1
    IF %1 = bearish GOTO s0
    IF %1 = neutral GOTO s0
    .....
    GOTO q1
```

to be included at the beginning of the rules section.

In the questions section we will include the following:

```
:q1
    ECHO Are you bullish, bearish
    or neutral on the stock? >>
    facts
    ECHO Are you bullish bearish
    or neutral on the stock?
```

and in the solutions section:

```
:s0
    rec (NO_SUITABLE
    STRATEGY_AVAILABLE)
```

At the beginning of a consultation, when kb.bat is called for the first time, %1 will not be equal to any of the three acceptable answers to the first question (bullish, bearish, neutral) and control will be transferred to label :q1, where OS-ES will ask the question and also write it into file facts. To get the answer it must, at this point, return control to you, and it is here that the programming trick to mimic interactive input is required. In the rules section, before GOTO q1, we will have inserted the command ECHO %0 %%1? > $.bat which, when executed, creates a new batch file, $.bat, containing one line only — kb %1?. (Remember that the dummy parameter %0 is always replaced by the name of the batch file in which it is contained, and that %%1 becomes %1 when output is directed to another file.)

In the questions section, just after the second ECHO command with the text of question q1, we insert ppp. This is a call to a separate batch file, ppp.bat, consisting of two lines:

```
ECHO OFF
PROMPT $G
```

The effect of calling ppp.bat is twofold: the execution of kb.bat is interrupted; and control is returned to the keyboard. The prompt is changed to '>'. The following two lines will thus appear onscreen:

```
Are you bullish, bearish or neutral on the
  stock?
  >
```

You will then enter the appropriate answer just after the prompt. This particular question admits, as we have seen, three acceptable answers — bullish, bearish and neutral. We will have created three identical batch files — bullish.bat, bearish.bat and neutral.bat — containing the following four lines:

```
ECHO OFF
CLS
ECHO %0 >> facts
$ %0
```

When the answer bullish, say, is entered it is written to the file 'facts', just after the line containing the question asked. The batch file $.bat is then called, which, remember, contains one line only — kb %1?. At call the dummy parameter %1 is replaced by the name of the calling batch file (that is, bullish) to obtain kb bullish?.

At this point kb.bat is called again, with bullish replacing %1 and ? replacing %2. At node A1 the first IF test is fulfilled (bullish = bullish is true) and the next command to be executed will be the one following label :b1.

What we have managed to do, in short, is to make the ES ask for the information it needs.

When the answer is entered the ES starts again from the first rule, but — being now in possession of the relevant information — it moves to the next node in the tree. This control strategy is called forward chaining in AI terminology.

In the process it has also recorded question and answer, so keeping track of the conversation with the user (tracing capability), and changed the prompt to emphasise that you are within the program environment.

Convenient error-trapping is also automatically provided. You must distinguish here between 'acceptable answers' for a given question and 'legal answers' for the entire ES. Acceptable answers for a given question are those which transfer control to a new node or to a solution. Acceptable answers for questions q1 are bullish, bearish or neutral; they are also legal answers, as are all the other acceptable answers for all the other questions in the tree. In our example, bullish, bearish, neutral, limited, large, unlimited, yes and no are all legal answers, and the ES contains eight identical batch files with these file names.

Error-trapping works as follows. If a legal, but not acceptable, answer is entered — for example, if yes is entered in reply to q1 — the question is repeated, because the conditions in the IF subcommands at node A1 are not true. If an illegal answer is entered — for example, bullis instead of bullish — the following message is displayed:

Bad command or file name.

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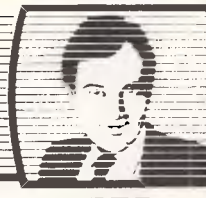

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bullis.bat does not exist. In both cases the prompt '>' follows, and you can enter an acceptable answer.

But let's come back to node A1. Had the answer to the first question been bearish or neutral, control would have been transferred to label :s0 in the solutions section of kb.bat. The batch file rec.bat would have then been called with the parameter: (NO__SUITABLE__ STRAGEGY__AVAILABLE).

The file rec.bat is the output manager of the expert system. It has three functions: displaying the recommended strategy onscreen; writing it into a file 'journ' preceded by the information contained in the file 'facts' (that is, the list of questions asked and answers received); and, in the case of the strategy s0, instructing you on how to backtrack, if desired, to the previous decision node. Backtracking is possible because $.bat maintains a 'memory' of the facts learned by the system so far.

The original prompt is finally re-established, indicating that you have left the program environment. The listing of rec.bat in Fig 2 shows the details of the implementation.

Coding the other ramifications of the knowledge base is now just a matter of repeating, at each node, what has been done at node A1. At each level a new question is included in the questions section, and a new dummy parameter is added when ECHO-ing to $.bat. If a question is irrelevant to certain solutions, the corresponding level in the tree is ignored; therefore, only relevant questions are asked, provided that the tree is properly structured. At certain nodes, a new solution is reached and added to the solutions section.

The resulting code is straightforward and easy to read, as you can see by simple inspection of the listing of kb.bat in Fig 2. Just remember that all legal answers must be present in the ES as batch files: in our example, these are bullish.bat, bearish.bat, neutral.bat, limited.bat, large.bat, unlimited.bat, yes.bat, no.bat. (Note that unlimited.bat will actually be unlimite.bat, as in DOS a filename can't exceed eight characters; this has, however, no practical consequence here.)

Now we need a way to start the program. This can be done through a file, start.bat, which may contain the title and some information on the ES, and must include, at the end, the following two lines:

```
IF EXIST facts DEL facts
kb?
```

The first line deletes — if it exists — the file 'facts' containing the trace, now useless, of the previous consultation, and the second line actually starts the program by calling kb.bat with '?' as first parameter. All you have to do to start a consultation is to enter 'start' after the prompt.

This, rather lengthy, description can be summarised by saying that the entire expert system consists of the following elements:

— a starter (start.bat);
— a knowledge base (kb.bat) containing three sections — rules, questions and solutions; and
— the I/O management files (ppp.bat, rec.bat, bullish.bat, ..., no.bat).

A listing of all the files which constitute the expert system of Fig 1 is shown in Fig 2. The code is reasonably self-explanatory, and you should have no problem in following it with the help of Fig 1. In order to improve legibility I have reserved capital letters for the DOS commands and the solutions, and used a structured style in writing the code. The sub-command ECHO OFF occupies the first line in all files, to avoid the situation where all the following lines will be shown onscreen. Only useful messages will appear instead.

With the exception of ppp.bat, all files include the command CLS in the second line to clear the screen. In practice you will see ECHO OFF briefly flashing on the screen, and then the next useful message or the prompt. The impression of a completely interactive system is almost perfect.

Fig 3 shows an example of consultation as it appears on the screen; Fig 4 is a consultation including backtracking; and Fig 5 is a printout of the file 'journ' with the record of the above consultations.

You may wish to run the ES on your PC and see how it behaves in actual use. At the end of the session, consisting of one or more consultations, you can print out the file 'journ' which contains the complete record of the session; 'journ' should then be deleted, unless you want the record of the next session to be appended to it. The other two files created during the session — $.bat and facts — are automatically dealt with by the program and you don't have to worry about them.

Using a RAM disk

An expert system using DOS as an inference engine is fairly slow, especially if it runs directly from disk. This is due to the frequent jumps from one batch file to the other, and the fact that the GOTO sub-command does not immediately transfer execution to the line following the label, but lets the system also scan all the lines in between. This considerably slows the execution, particularly when

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the system has reached a deep level in the tree. Much strain is also imposed on the disk drive, which is kept busy all the time.

A better method is to copy the ES, together with any external DOS command used, into a RAM disk and run it from there. The increase in speed is remarkable and there is no overload on any disk drive. A further marginal increase in speed can also be obtained by using a run-time version of the program, where all the comment lines (those beginning with REM) have been suppressed. Nonetheless, you shouldn't encounter any problems when running the OS-ES subset.

The complete OS-ES comprises, in the present version, eight levels and more than 20 strategies. It runs quite efficiently in RAM, and is barely acceptable when run from disk. More complex expert systems may, however, become unacceptable slow.

Limitations

The major limitation of DOS as an ES shell is the inability to perform mathematical calculations other than the simplest form of equivalence. The batch sub-command IF string 1 = = string 2 command actually compares the ASCII values of the characters in string 1 and string 2. Thus, while 2 = = 2 is true, 1+1 = = 2 is false (for the same reason as a = = A is false, so watch out when using both capital and small letters in the code). Consequently, DOS can be used as an inference engine only for expert systems not involving mathematical calculations.

Nondeterministic systems requiring fuzzy logic are typically excluded, since probabilities can't be calculated, but there are many applications for which this is not a serious constraint.

Another limitation is that only up to 10 dummy parameters — %0 to %9 — can be specified within a batch file. As %0 is reserved to the file name, this means that in practice the expert system can only contain up to nine levels, although this limit can perhaps be increased by clever use of the SHIFT sub-command, which allows command lines to make use of more than 10 replaceable parameters. But nine levels are not too bad, and there is no limit to the ramifications between levels (that is, the number of acceptable answers to a given question).

Conclusion

DOS can be used to develop simple expert systems with many desirable characteristics. The knowledge base is easy to code, read, maintain and update. Friendly interface, backtracking capability, error-trapping and tracing/recording facilities are all available.

It is worth noting that what is possible with DOS is certainly possible with the more powerful operating systems used in minis and mainframes. Coding is equally easy, interactive I/O and a larger choice of commands are available, mathematical calculations of some complexity are possible, and execution speed is not a problem. Using operating systems as inference engines may indeed prove a convenient way, in certain cases, to develop expert systems without having to learn a new programming language or buy expensive commercial shells.

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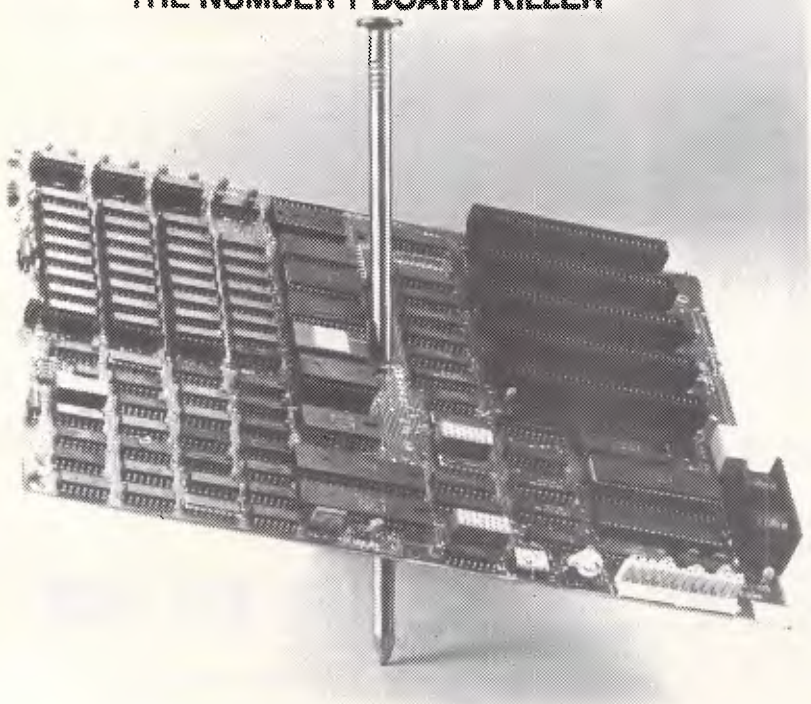

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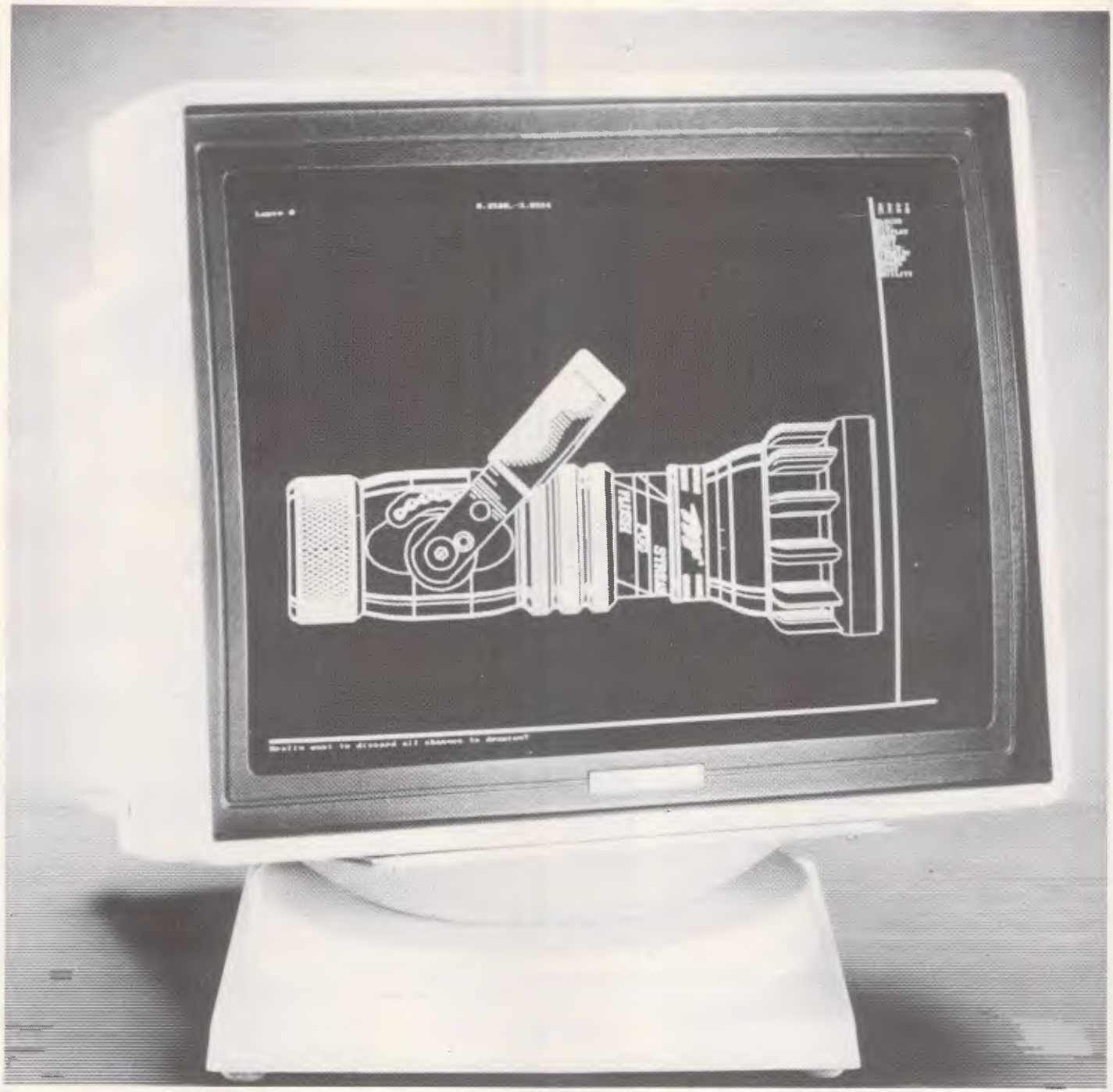

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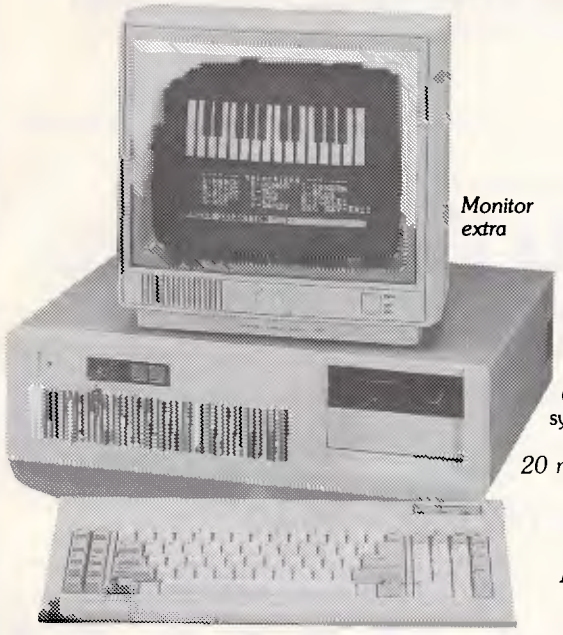

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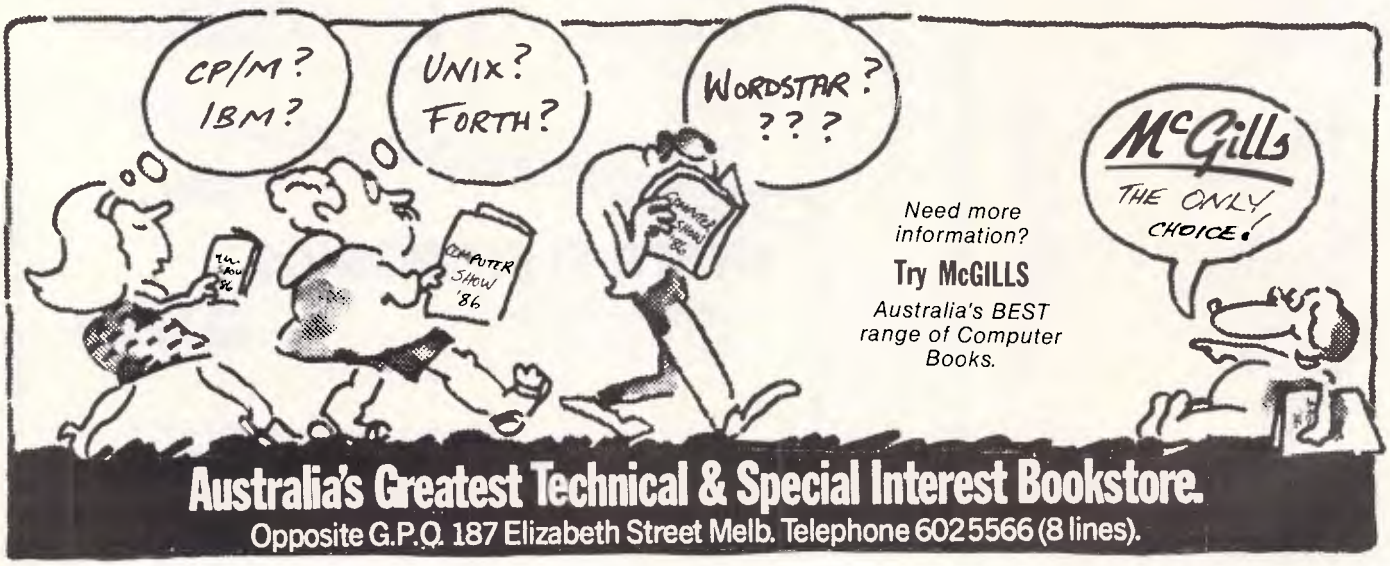

From an introduction to PC-DOS and MS-DOS to a quick 30 hour stint on home computing, David Taylor sifts out those books worthy of salvation.

Beat the clock

Mr Prigmore believes he can teach you in 30 hours to harness your hitherto frivolously-used home micro to perform really useful tasks. I do not.

What he has in mind is mastering word processing, spreadsheets, databases, stock control, mail-merging, filing, accounting — stuff like that.

You might think he's crackers, but Mr Prigmore knows he's already done a similarly structured book to teach Basic in 30 hours and that sold 150,000 copies, so there.

Carry on, Mr Prigmore.

'Figure 2 shows a thin plastic disk covered in magnetic material, housed in a plastic envelope.'

Oh, no. Not another picture of a square with a circle in it, *please*.

'When you come to input data, and particularly text when word processing, you will find it most convenient to have a standard typewriter or 'Qwerty' keyboard, especially if you are a trained typist.'

Indeed, I have to agree that I, too, have found such to be the case.

'The words LOAD and RUN are examples of commands which belong to the high-level programming language called Basic.'

They surely do.

'If your interests involve any type of numerical calculation, either simple or complex, then a spreadsheet package will be of great value to you.'

No question.

And so it goes on and, I don't doubt, will again sell very well. Just don't ask me to recommend it.

Title: 30-Hour Useful Home Computing
Author: Clive Prigmore
Publisher: Century Communications/ Hutchinson
Price: $32.95

Easy DOS It

Not a man to leave anything to chance, this all-American Mr Sheldon. 'The first thing to do,' he advises, 'is to locate the DOS disk.' 'Ere, hang on, not so fast! Where's our little picture, then? There's *always* a little picture of a floppy disk. Yup, here we are, page 85: drawing of a square with a dotted circle inside it and an arrow to point out the write-protect notch. Can't be too careful. Righty-ho, carry on . . . 'Now all you have to do is to place the disk in the start-up drive, label side up, and turn the system on.'

Reckon you're getting the hang of it so far? I mean, you do start to wonder whether this is a book for beginners or for half-wits. I cannot for the life of me see the point in churning out page after page of instructions so stupefyingly obvious that anyone having trouble at this level might need a set of manuals to tie up a shoelace.

The book does get more testing as it chugs on, and is well enough produced, but it's wearisome to go over and over so much familiar ground. I suppose the theory is that since there are now well over 50 PCs, aside from IBM's bestselling old stager, which operate with Microsoft's masterpiece (or a slightly tailored version of it), that must be one enormous potential market for a DOS primer. Never mind that, well over 50 PC makers have already taken a crack at improving IBM's original pink ringbinderful of instructions, or that perhaps 50 or more authors have also had a go at trying both to simplify and to expand on DOS.

Here we go yet again: creating files, how to work EDLIN, getting to grips with tree-structured directories and batch files, what does FORMAT do (if you don't know *that*, you had better read this book!), some tips on getting DOS to assign a RAM drive or to perform extra file-sorting tricks, accept customised commands, and so on. It's all *very* cautiously step-by-step and thorough. You can get to Chapter 28, well into the Part II advanced section, and still come across sentences like: 'The printer is one of the biggest assets to your computer system; without it there would be no hard copy.' Struth!

Mr Sheldon, by the way, lives in Santa Barbara where he is engaged in developing 'user-friendly shells for computers.' If ever he plans an even more simple-to-grasp book on those, he could perhaps ask Postman Pat to ghost it.

Title: Introducing PC-DOS and MS-DOS
Author: Thomas Sheldon
Publisher: McGraw-Hill
Price: $39.95

Word gets around

One of a first-class series, this, which not only holds hands as you familiarise yourself with such Microsoft winners as Word or Chart, but also includes Cary Lu's nothing-if-not-comprehensive guide to the Mac and the redoubtable Bill 'Cracker' Landreth's confessions of an FBI-busted hacker.

The Katers (who, by the way, wrote Epson's printer manuals) are here concerned with Microsoft Word, for my money the best word processor there is,

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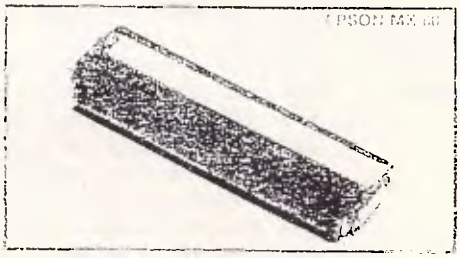

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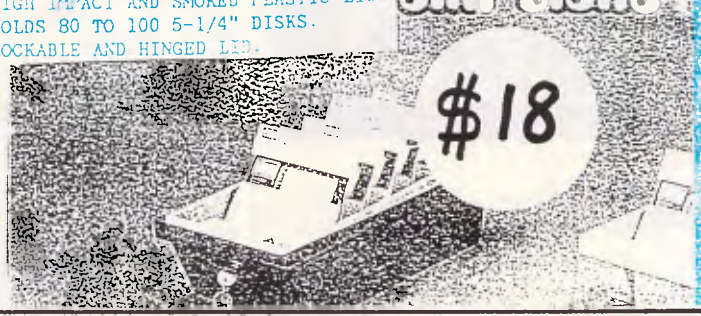

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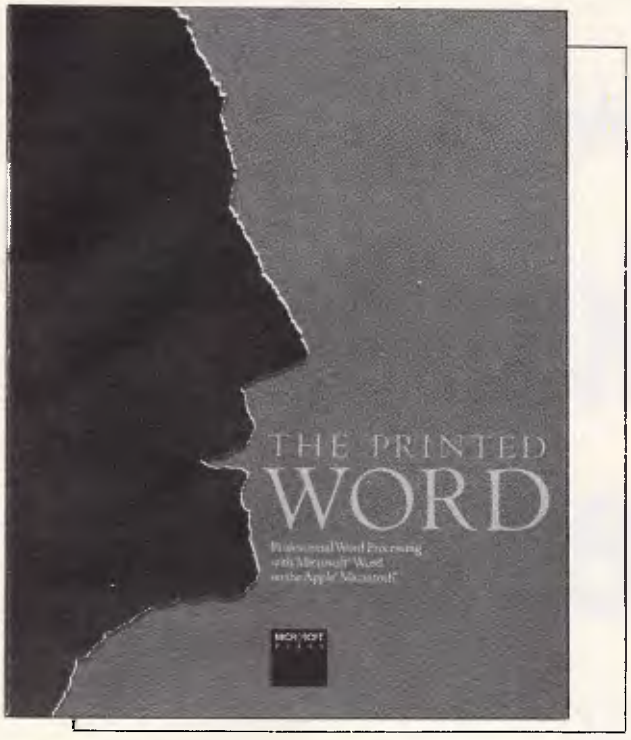

running on the Apple Mac, to which I've also taken quite a shine.

I can't fault their authority, nor yet their lucid style. In some ways, Word is the more remarkable when run on IBM's PC, and the Mac's quite separate strengths with bog-standard MacWrite, are not so obviously out-classed by Word. Still, it's a formidable combination just the same. Word's bells-and-whistles versatility and Mac's ease of use, never more so than when the Katers get to grips with what can be achieved using top-of-the-line printers (like the fabulously good, quick and expensive LaserWriter) — professional reports that make full use of Word's fancy formatting, multi-column newsletters that incorporate graphics and tables, even high-quality brochures or business forms which would not shame a professional typesetting house.

Great stuff if you can afford it: $34.95 isn't bad for the book. If you can persuade your company to stump up a few thousand for the rest of what you need to get going, I shouldn't hesitate.

Title: The Printed Word
Author: David A Kater, Richard L Kater
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A respectable number of topics are set out as *prêcis:* thus the layman can locate a chunk of text on, say, programming, central processors or storage devices, while there are dozens of more technical essays on, for example, Boolean algebra, languages, debugging or virtual storage.

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SOFTWARE

Thanks for the memory

Samual Dick describes the functions of a memory management unit, and explains why such a unit is an invaluable aid in extracting the maximum performance from a micro.

The ability to extract a litre out of a 500ml jug has, like alchemy, long been sought after by mankind. Today, the problem reappears in the computer world — the quest continues to extract the maximum performance out of any computer. As software has become more complex, it has grown in size; operating systems and compilers with storage requirements near 1 Mbyte are not uncommon, and applications programs can certainly exceed them in size. In many cases, such as digital image processing, it may be the data to be manipulated which takes up the space.

The increasing complexity in software has been matched by the improvement in hardware performance. Processors are intrinsically more able due to their rich instruction sets and different addressing modes. They are increasingly supported by intelligent peripheral handlers, floating-point math chips, and real-time interrupt control units. One of these support chips is the Memory Management Unit (MMU). Totally transparent to the high-level applications programmer, the memory management unit has helped systems programmers to tackle the space problem created by the ever-increasing size of software packages. With common processors, like the 68000 or National Semiconductor's NS16000 series, which routinely have 16 Mbyte address spaces, the MMU's function is becoming more important.

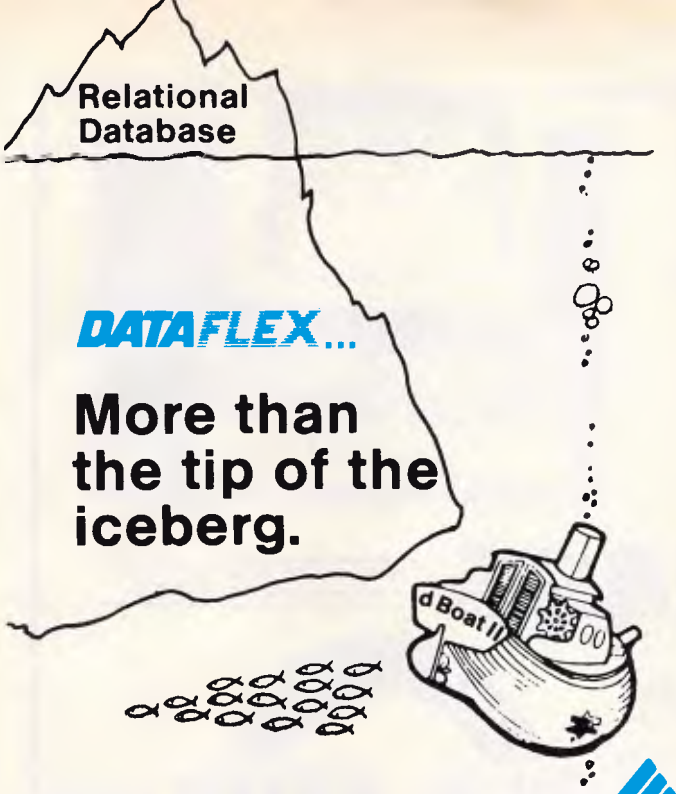
Filling the jug

To understand how the MMU goes about its task, we must look at how a computer goes about executing a program. Typically, the program will have been written in a high-level language such as Pascal or Fortran, and will have been stored on a disk or tape as source code. In order to translate the source code into an executable form (machine code), the source is compiled to produce object code. Object code is rather like machine code, except that references to code called in by the program are left in dummy form. For example, a user might have written a program which is required to write to the VDU screen (a Basic 'Print' command, for example). At compile time, the compiler will translate the Print command into a call to a system subroutine which has the task of writing the required string to the VDU. However, the actual address at which the system routine starts will not be appended — only its name will be sent to the object file.

This may seem to be an example of double-handling, but its advantages will be explained eventually. The task of going through the object file and inserting the machine code referred to by the compiler's calls to routines is handled by the linker. The linker reads in the object file and searches in system and/or user libraries of subroutines to complete the references made by the compiler, and outputs the resultant executable image. The executable image is a file of the machine code instructions that will be resident in the machine's core when the program is run.

At run time, the operating system loads the executable image into core. To take a simple system, the image will have a start and end in the processor's address space and will be present in core for the duration of its life — that is, until the running program ends.

The Run command sets the program counter to the start address of the image, and execution commences. Such an 'absolute loader' (Fig 1) relies on the addresses used in the executable image being those that will be used as the program runs. For example, if a program uses a GOTO instruction, then the compiler will have translated it into a JMP $12E3 instruction where 12E3 is the hexadecimal address of the GOTO's destination. The addresses used as destinations of GOTOs or subroutine calls must be known at link time. The linker produces machine code for the executable image exactly as it will be at run time.



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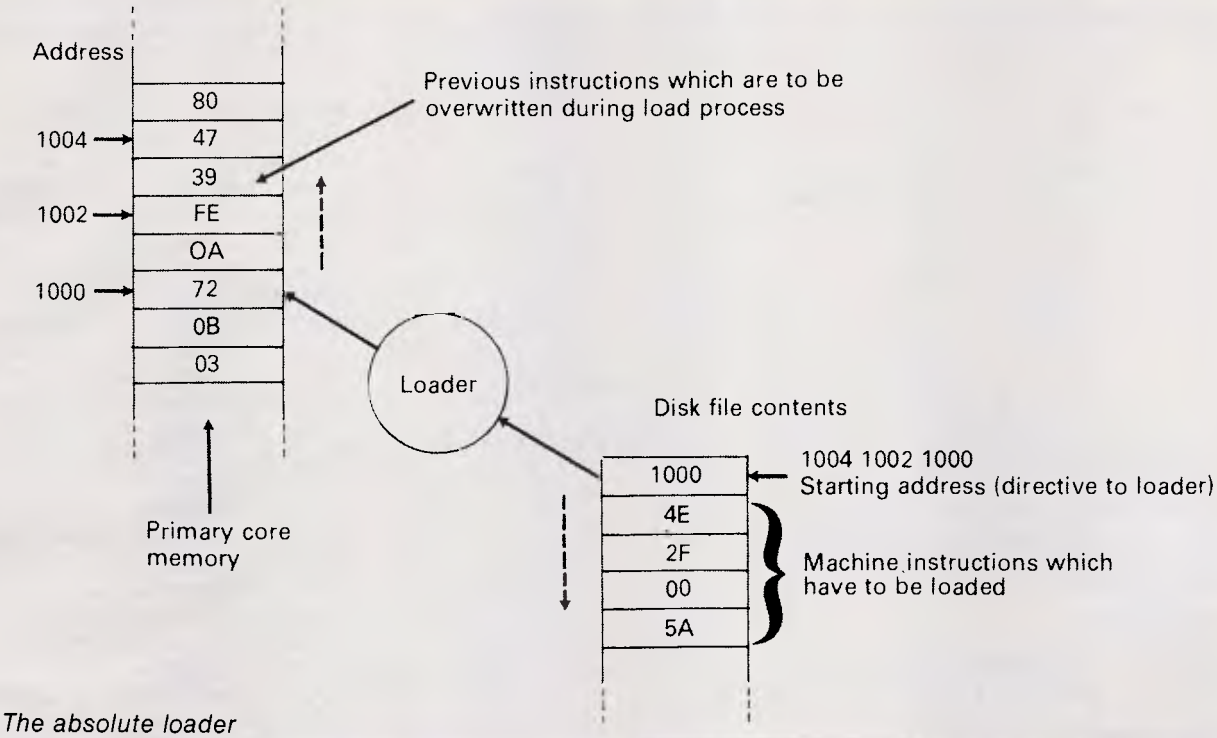


Fig 1 The absolute loader

However, this simple loader has its disadvantages. The processor's address space may not be clear of other programs and memory-mapping addresses for peripherals, so the loader might have to transfer the program into different parts of memory, depending on the space available.

To solve this problem, the relocating loader is used and the compiler is designed to produce object code which is compatible with the loading technique. Now, the executable image may be placed anywhere in core because the image stored on disk or tape does not contain absolute addresses — instead, it contains offsets calculated relative to the start of the program. When the program is loaded, a constant is added to all the offsets to produce the absolute address. This is illustrated in Fig 2.

The simple relocating loader allows you to place a program anywhere in the processor's address space by changing the constant, and the final decision about where it is placed can be deferred until the program is run. In a large multi-user machine, user A's program might be run in the space $115A to $12FF today but in $1044 to $11E9 tomorrow, because those are the only locations in core which are not being used by any other users (this fact will not necessarily be known by the user and will not affect the running of the program).

Machine code (6800)

Address	Contents
0000	7F CLR 8005 ; clear location 8005
0001	80
0002	05
0003	86 LDAA FF ; load accumulator A with 255
0004	FF
0005	B7 STAA 8004 ; store accumulator A to location 8004
0006	80
0007	04

Relocation table

Address	Contents	
Arbitrary	00	0001 and 0006 are two addresses which
+1	01	require relocation in the above machine code.
+2	00	The addresses starting at 0001 and 0006 will
+3	06	have an offset added to them before execution
+4		

Fig 2 Relocation schematic

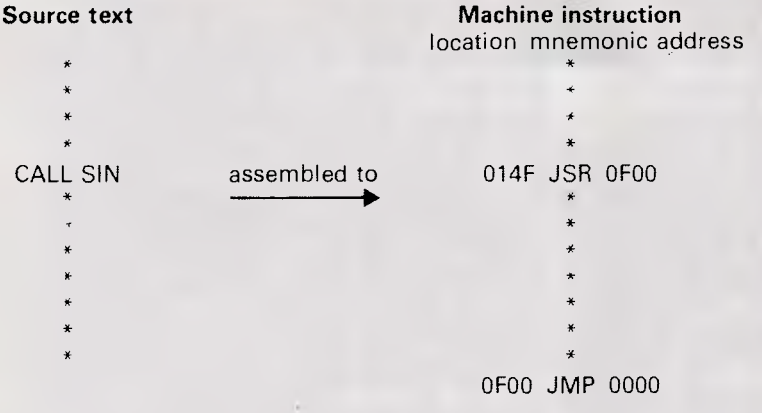
Litres into 500ml jugs

With old computers, small users would stand in awe of large users who, when they piled their stacks of punched cards on the computer operator's table, would write 'Full Core' on their Job Request Card. This two-word incantation signified that their job was so large that the whole of the processor's memory (which might have been only 32 kilo-words) was required. Today, such precautions are not necessary due to the advent of 'virtual memory'.

The concept of virtual memory is simplicity itself. When you consider the way in which a processor runs a user's program, you see that the processor is only executing one instruction at a time; as far as it is concerned, the other parts of the program might not exist.

Virtual memory systems recognise this, and only keep a small part of the user's program in core at any time. The part in core is, of course, the section of the program which is executing or about to be executed by the processor. The remainder of the program is held on disk, and can be called into core within a few milliseconds when it is required.

The memory of the processor — both



Linker uses a jump instruction with dummy jump address, and places SIN and 0F00 in the symbol table

Once the linker locates the SIN function, the dummy jump address (0000) will be replaced with the real address of the function

Symbol table

Function	Address of Jump
SIN	0F00

Fig 3 Linking

the actual core of the machine and the disk space allocated as virtual core — is partitioned into 'pages' which are typically 512 bytes in size: a 16Mbyte address space will have 32k pages. Most of these pages will be held on disk — 'swapped out to disk' — while perhaps only 1Mbyte or 2k pages will be resident in the machine's memory. Now you can see why litres *do* fit into 500ml jugs — it's just that not all of the litre is in the jug at any one time!

The pages come in two varieties: physical pages, which are pages of real memory — 'core'; and virtual pages, which are purely a software convenience. To see how the pages work and how the processor organises its memory at run time, let's consider an example.

A user runs a program on the machine. The operating system allocates the program 20 pages (virtual), which are numbered from, say, 101 to 120. The program starts at page 101 and ends at page 120. When the system loads the program, only five physical pages are available in core, so pages 101 through 105 are loaded into memory and the processor starts to execute code contained in virtual page 101. As execution proceeds, page 105 is finished with, and as there is no more physical memory containing program instructions, virtual pages 101 through 105 are swapped out to the disk and the next five virtual pages are brought in to core. When that has been done, execution of the program continues.

This is the importance of the relocating loader — being able to swap pages of program code to and from core relies on being able to execute code anywhere in the address space.

Invisible to the CPU

Keeping track of which virtual pages are in core and which are swapped out to disk would be very wasteful of processor time: it would have to calculate the physical address for each memory access from the virtual address.

Enter the Memory Management Unit. Each time the processor attempts to access a memory location, for either a read or write operation, the MMU translates the virtual address contained in the software to the physical address. If the physical address is in core, the memory access proceeds. If the required location is not resident in core, the MMU will set about loading the page of memory containing the required location from disk into core. This translation and loading is invisible to the processor and the user; all the user sees is a large program or large arrays of data being handled effortlessly by the machine.

The translation procedure is performed by the MMU with the help of the operating system. Inside the MMU, a table is maintained of correspondence between virtual and physical pages — rather like a dictionary which allows us to translate between languages. This table is maintained by the operating system and the MMU, and is typically known as the Page Translation Cache.

Apart from memory management the MMU performs other duties.

Within the MMU, the operating system can set protection flags on a page that, for instance, allows read-only access or access only to privileged users. Protection is important on most multi-user systems: it helps prevent the hacker syndrome and, in real-time applications, where a multi-million dollar facility is being controlled online, it can prevent software bugs from spreading catastrophe.

Dynamic (at run time) debugging is simplified by the MMU because it can carry out hardware breakpoints during program execution, and can also trace

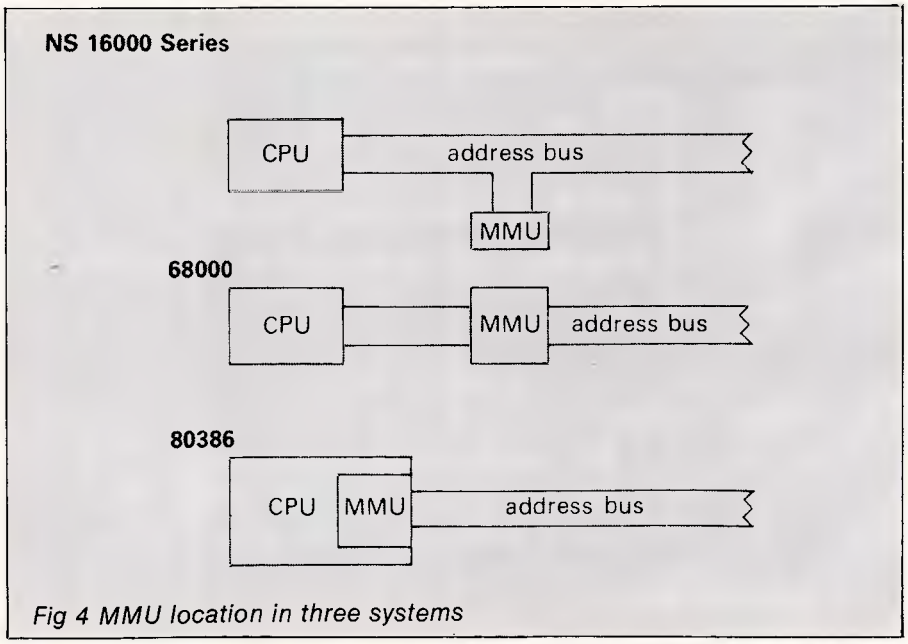


Fig 4 MMU location in three systems

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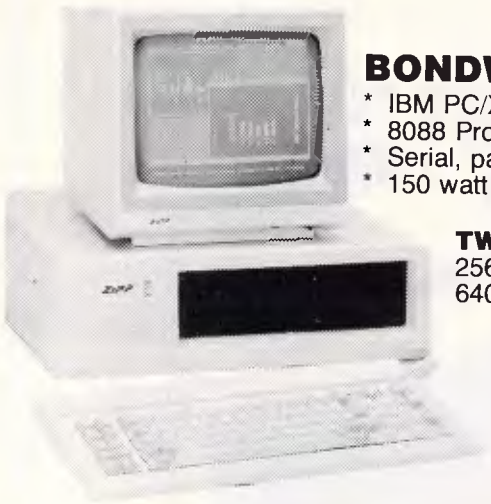

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the last few operations of a program before, say, a conditional GOTO. Anyone who has ever used a dynamic debugging tool appreciates the immense aid it represents — the ability to make the processor watch certain variables (to see when they change value), examine the value of or deposit a new value into a variable while the program is running greatly eases detection of non-syntax errors.

The MMU can also keep an eye on hardware errors. Most memories have sophisticated error correction and control hardware built-in, and virtual memory systems help the computer engineer to design-in robustness. When the machine runs its diagnostics, extensive checking of physical memory takes place. If a fault is found, the software marks the page in which the error occurs as 'unavailable'. As the operating system is accustomed to shunting pages of virtual memory around to place them in unused physical pages, the avoidance of bad pages of physical memory does not cause severe problems; a large number of bad pages will only slow down the machine because more swapping has to be done to avoid them.

Clock cycle:	one period of the system's timing oscillator
Handler:	hardware and software designed to allow the processor to control a peripheral
Linker:	a program which 'joins together' the various procedures in a user's program
Loader:	a program which loads primary memory from the secondary store
Offset:	that part of an address which represents the location of a byte within a page
Page:	an arbitrarily-defined section of memory — typically 512 bytes
Page fault:	a state generated when the page required by the processor is not in core
Page number:	that part of an address which defines which page a particular address occurs on
Page table:	a section of memory (which may be within the memory management unit) in which the map giving the relationship between virtual and physical addresses is kept
Physical address:	the address which will be present on the address bus of the memory
Relocation:	the process of moving a section of code in memory or altering the addresses within a section of code so that the code executes in a manner independent of its place in core
Symbol table:	a section of memory used by the linker which acts as a cross-reference dictionary for the calling address of subroutines, functions, and so on
Virtual address:	the address which is placed on the address bus by the processor — a notional address which has to be translated by hardware into a physical address

Fig 5 Glossary

Working together

With memory management units proving so useful in address translation and debugging, it is obvious that they should be an integral part of any system architecture. How do the processor and the MMU work together? The exact method is dependent on the processor.

The National Semiconductor 16000 series processors (which range from 8-bit through to 32-bit CPUs) use a different technique to Motorola's 68000. When a 16000 series processor wakes up after a Reset command, it checks to see if an MMU is present. If the MMU is not present, memory accesses take four clock cycles: the address is placed on the address bus during the first cycle while the data is read-in during the fourth cycle. However, if the MMU *is* present, the processor configures itself so that memory accesses take five machine cycles. The processor places the virtual address onto the address bus during the first cycle. On the second cycle, the MMU places the translated (physical) address onto the bus and issues a Physical-Address-Valid signal. The data is latched into the processor during the fifth cycle when the Read-Data strobe has been activated. Contention over the address bus while the MMU is in control of it is prevented by the processor placing its address port into a high-impedance state, leaving the MMU to specify the physical address.

If the MMU has to update its internal translation table or a page of virtual memory has to be brought into core, the MMU goes about the action autonomously.

The 68000 processor also has an MMU chip. Unlike the NS16000 series MMU, the 68000's unit is placed in the address bus between the processor and the memory. If a page is selected and results in an access violation because the page of virtual memory has to be loaded into core, the 68000 idles until the page is made available. In multi-tasking systems, the idle time would be allocated to another user so that no machine time is wasted.

The Intel 80386 processor contains a memory management facility within the processor chip itself, which breaks the memory space of the processor into pages just like the other processors. Intel uses larger pages (4k), which allows the 4Gbyte physical address space of the machine to be mapped within the registers held in the processor.

Conclusion

What do virtual memory and the MMU mean to the average user? The advantages are really only apparent on large systems, although there is nothing to stop MMUs being used on 8-bit micros. With large, powerful machines, virtual memory gives the programmer freedom from having to worry about fitting a program into the physical (core) memory of the machine. Images, perhaps 2048x2048 pixels in size, can be handled using a machine with only 1 Mbyte of core. As code has to be able to be used at any address in core, compilers and linkers produce machine code that can be shared between users so that the machine gives a truly interactive feel. Virtual memory brings us one step closer to having the perfect machine which is free from all physical constraints — just what the users want.

And the MMU? It just sits quietly by the processor, helping as required. The MMU lets even the processor forget that it has a limited physical memory, and guards sections of memory against illegal access. If someone is debugging, it helps the processor watch for users' program breakpoints.

And what of the future? An attractive scenario is one where each individual has a powerful, personal workstation — almost a return to single-user systems. As the price and physical size of fast-access semiconductor memory continues to decrease, it is tempting to speculate that the importance of virtual memory will decrease. The full addressing range of even 32-bit processors may be fully implemented as core — then litres *will* fit into 500ml jugs.

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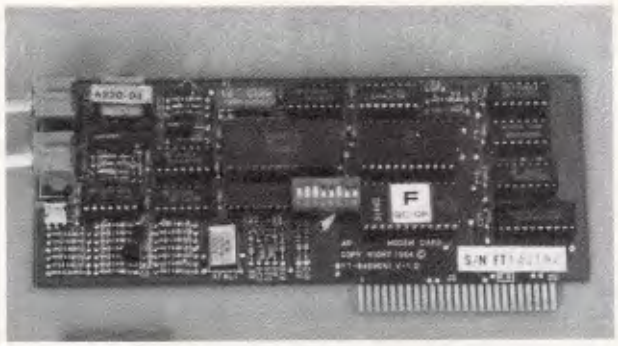

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Enigma variations

Throughout the Second World War, and also in civilian life, the Enigma cipher machine was a vital key in security. CJ Davies describes the intricacies of both the civilian and military formats, and presents a Basic Enigma simulation program.

The German Enigma cipher machine of the Second World War was basically a simple machine, but it required the work of many of the finest minds to decode enciphered messages — and even this was only possible when the machine was used in a careless manner. Even today, it would be difficult, if not impossible, to decipher a message which had been doubly enciphered on the machine, without a prior knowledge of the machine settings used.

Civilian Enigma

The Enigma machine in its most basic form was invented in the 1920s, and was patented for use in banks and similar institutions. Externally the machine consisted of a keyboard similar to a typewriter's, but without numeric or punctuation keys. Above the keyboard was a panel marked with the 26 letters of the alphabet, with a small electric bulb above each letter. When a key was pressed, a light on the panel would be illuminated; the letter below it was the incipherment of the character on the key, and would be written down by the cipher clerk.

An important feature of the machine was that it was self-inverse — that is, no special decipher setting was required. If two machines were set to the same starting configuration, cipher text produced on one machine could be converted into plain text merely by entering it on the other.

Another feature of the machine was that a character could not be enciphered into itself.

The keys operated electrical switches which sent an electric current to one of 26 electrical contacts arranged in a circle on the inside of the front casing of the machine. The connection pattern was quite straightforward; the A character being connected to the first contact, B to the second, and so on. Inside the casing, mounted on a common shaft, were three rotors, each of which had 26 electrical

```
1000  REM  ENIGMA MAIN PROGRAM
1010  REM
1020  DIM R1(28): DIM R2(28): DIM R3(28): DIM REF(28): DIM PBD(28)
1030  LET N = 1000: DIM A%(N): DIM B(3): REM   INPUT BUFFERS
1040  LET CTR = 0:RFLAG = 0
1050  GOSUB 2420: REM  SET PLUGBOARD
1060  GOSUB 4100: REM  SELECT ROTORS
1070  GOSUB 3150: REM  SET RINGS
1080  GOSUB 3750: REM  SET ROTORS
1090  GOSUB 3510: REM  INPUT TEXT
1100  GOSUB 2790: REM  PASS THRO PLUGBOARD
1110  GOSUB 2070: REM  PASS THRO ROTORS
1120  GOSUB 2790: REM  PASS THRO PLUGBOARD
1130  IF RFLAG = 1 THEN 1000
1140  GOSUB 2100: REM  OUTPUT TEXT
1150  END
1160  REM
1170  REM   INCREMENT ROTORS ROUTINE
1180  REM
1190  GOSUB 1300: REM  INCREMENT ROTOR 1
1200  LET N1 = N1 + 1: IF N1 < 29 THEN 1280
1210  LET N1 = 1
1220  GOSUB 1370: REM  INCREMENT ROTOR 2
1230  LET N2 = N2 + 1: IF N2 < 29 THEN 1280
1240  LET N2 = 1
1250  GOSUB 1440: REM  INCREMENT ROTOR 3
1260  LET N3 = N3 + 1: IF N3 < 29 THEN 1280
1270  LET N3 = 1
1280  RETURN
1290  REM
1300  REM   INCREMENT ROTOR 1 ROUTINE
1310  REM
1320  LET TEMP = R1(1)
1330  FOR K = 2 TO 28: LET R1(K - 1) = R1(K): NEXT
1340  LET R1(28) = TEMP
1350  RETURN
1360  REM
1370  REM   INCREMENT ROTOR 2 ROUTINE
1380  REM
1390  LET TEMP = R2(1)
1400  FOR K = 2 TO 28: LET R2(K - 1) = R2(K): NEXT
1410  LET R2(28) = TEMP
1420  RETURN
1430  REM
1440  REM   INCREMENT ROTOR 3 ROUTINE
1450  REM
1460  LET TEMP = R3(1)
1470  FOR K = 2 TO 28: LET R3(K - 1) = R3(K): NEXT
1480  LET R3(28) = TEMP
1490  RETURN
1500  REM
1510  REM  INPUT A CHAR ROUTINE
1520  REM
1530  GET A$
1540  IF MODE = 4 THEN 1640
1550  IF ( ASC (A$) < 65) OR ( ASC (A$) > 90) THEN 1570
1560  IF ( ASC (A$) < 70) OR (MODE <  > 1) THEN 1680
1570  IF MODE = 1 THEN 1650
1580  IF A$ = " " THEN A$ = "*"
1590  IF (A$ = "*") OR (A$ = "@") THEN 1680
1600  IF MODE <  > 3 THEN 1650
1610  IF A$ =  CHR$ (8) THEN 1680: REM  <-
1620  IF A$ =  CHR$ (18) THEN  GOSUB 1660: IF RFLAG = 1 THEN 1680
1630  IF A$ =  CHR$ (16) THEN  GOSUB 1770: IF GFLAG = 1 THEN 1680
1640  IF A$ =  CHR$ (27) THEN 1680: REM  ESCAPE
1650  IF A$ <  >  CHR$ (1) THEN 1670
1660  HOME : END : REM  CTRL-A ABORT
1670  PRINT  CHR$ (7);: GOTO 1530
1680  RETURN
1690  REM
```

Fig 1 The Basic Enigma simulation program

contacts on each side. The contacts on one side of a rotor were connected to the contacts on the other side, in a jumbled manner. The electric current from one of the contacts on the inside of the front casing would enter a contact on the front of the outermost rotor, and exit from a contact at its rear. It would then pass in a similar manner through the middle rotor and, finally, through the innermost rotor. Behind the innermost rotor was a fixed set of 13 wires, each connecting two of the contacts on the back of the innermost rotor; this was known as the reflector. After passing through the reflector, the current would pass back through the rotors (the path followed would, through necessity, be different from the incoming path). The current would leave the casing through one of the contacts on the front casing and illuminate the corresponding bulb.

It can be seen that if a given rotor setting transformed an R into a J, then it would also transform a J into an R. After each character had been enciphered, the outermost rotor would be stepped forward by one position before the encipherment of the next character. When the outermost rotor completed a revolution, the middle rotor would be incremented, and so on, in the manner of an odometer. (In practice the Enigma varied somewhat from this, but if you assume that the opposition knows how the machine works, which you should, then you might just as well use the straightforward way.)

Before the machine was used, the positions of the three rotors would have to be set to a pre-arranged starting position. As each rotor could be set to any one of 26 positions, the number of possible configurations was, with fixed rotors, 17,576 (26^3). The period of the machine was also 26^3.

For readers not familiar with the concept of the period of a cipher machine, it means that if the same character were enciphered repeatedly, then the machine would produce an apparently random sequence of characters; this sequence of characters would start to repeat itself once the period of the machine was exceeded. Provided that the period of a machine is longer than the longest message to be transmitted, then the period is not of vital importance — but the number of configurations most definitely *is* important. From the point of view of military use, 26^3 configurations would be hopelessly inadequate as they would be easy to crack using the brute force method of trying all configurations.

Before I go on to describe the modifications made to Enigma to render it suitable for military use, I must point

Continued

```
1700  REM  CONVERT A CHAR ROUTINE
1710  REM
1720  IF A$ = "*" THEN PTR = 27: GOTO 1750
1730  IF A$ = "@" THEN PTR = 28: GOTO 1750
1740  LET PTR =  ASC (A$) - 64
1750  RETURN
1760  REM
1770  REM  CHECK CTRL-P OK ROUTINE
1780  REM
1790  LET BFLAG = 0
1800  IF CTR > 2 THEN 1840
1810  IF (CTR = 0) AND (HI <  > 0) THEN 1840
1820  IF (CTR = 1) AND (LO = 1) THEN 1840
1830  LET BFLAG = 1:CTR = CTR + 1
1840  RETURN
1850  REM
1860  REM  CHECK CTRL-R OK ROUTINE
1870  REM
1880  IF HI < LO THEN 1900
1890  LET RFLAG = 1
1900  RETURN
1910  REM
1920  REM  PROCESS A CHARACTER ROUTINE
1930  REM
1940  LET PTR = R1(PTR):PTR = R2(PTR):PTR = R3(PTR)
1950  LET NDL = REF(PTR)
1960  FOR K = 1 TO 28
1970  IF R3(K) = NDL THEN NDL = K:K = 28
1980  NEXT
1990  FOR K = 1 TO 28
2000  IF R2(K) = NDL THEN NDL = K:K = 28
2010  NEXT
2020  FOR K = 1 TO 28
2030  IF R1(K) = NDL THEN OUT = K:K = 28
2040  NEXT
2050  RETURN
2060  REM
2070  REM  PASS THRO ROTORS ROUTINE
2080  REM
2090  HOME : FLASH : PRINT "STANDBY PROCESSING TEXT": NORMAL
2100  FOR J = LO TO HI
2110  LET PTR = AX(J)
2120  GOSUB 1920: REM  PROCESS A CHAR
2130  LET AX(J) = OUT
2140  GOSUB 1170: REM  INCREMENT ROTORS
2150  NEXT
2160  RETURN
2170  REM
2180  REM  OUTPUT TEXT ROUTINE
2190  REM
2200  HOME : PRINT "OUTPUT TO SCREEN OR PRINTER ? ( S OR P ) -->";
2210  LET MODE = 3: GOSUB 1510: REM  INPUT A CHAR
2220  IF A$ <  > "S" AND (A$ <  > "P") THEN  PRINT  CHR$ (7);: GOTO 2210
2230  PRINT A$: IF A$ = "S" THEN 2250
2240  PRINT  CHR$ (4);"PR#1"
2250  FOR J = 1 TO HI
2260  LET OUT = AX(J)
2270  GOSUB 2350: REM  RECOVER CHARACTER
2280  PRINT B$;
2290  IF (A$ = "P") AND (J / 80 =  INT (J / 80)) THEN  PRINT
2300  NEXT
2310  PRINT
2320  IF A$ = "P" THEN  PRINT  CHR$ (4);"PR#0"
2330  RETURN
2340  REM
2350  REM  RECOVER CHARACTER ROUTINE
2360  REM
2370  IF OUT < 27 THEN B$ =  CHR$ (OUT + 64): GOTO 2400
2380  IF OUT = 27 THEN B$ = "*": GOTO 2400
2390  LET B$ = "@"
2400  RETURN
2410  REM
2420  REM  SET PLUGBOARD ROUTINE
2430  REM
2440  HOME : PRINT "SETTING PLUGBOARD": PRINT
2450  LET LDS = 0:J = 28:OLD = 0
2460  PRINT "DISPLAY REMAINING CHARS ? Y/N-->";
2470  LET MODE = 3: GOSUB 1510: REM  INPUT A CHAR
2480  IF A$ <  > "Y" AND (A$ <  > "N") THEN  PRINT  CHR$ (7);: GOTO 2470
2490  LET YFLAG = 0: IF A$ = "Y" THEN  LET YFLAG = 1
2500  PRINT A$: PRINT
2510  FOR K = 1 TO 28
2520  IF PBD(K) <  > 0 THEN 2680
2530  LET OUT = K: GOSUB 2350: REM  RECOVER CHAR
2540  PRINT B$;" SWAPS WITH -->";
2550  LET MODE = 2: GOSUB 1510: REM  INPUT A CHAR
2560  IF A$ = B$ THEN PBD(K) = K: GOTO 2600
2570  GOSUB 1700: REM  CONVERT A CHAR
2580  IF PBD(PTR) <  > 0 THEN  PRINT  CHR$ (7);: GOTO 2550
2590  LET PBD(PTR) = K: LET PBD(K) = PTR: LET LDS = LDS + 1
2600  PRINT A$;
2610  IF LDS = OLD THEN  PRINT : GOTO 2640
2620  LET S1$ = " ( ": IF LDS > 2 THEN S1$ = S1$ + " "
2630  PRINT S1$;12 - LDS;" LEADS LEFT )"
```

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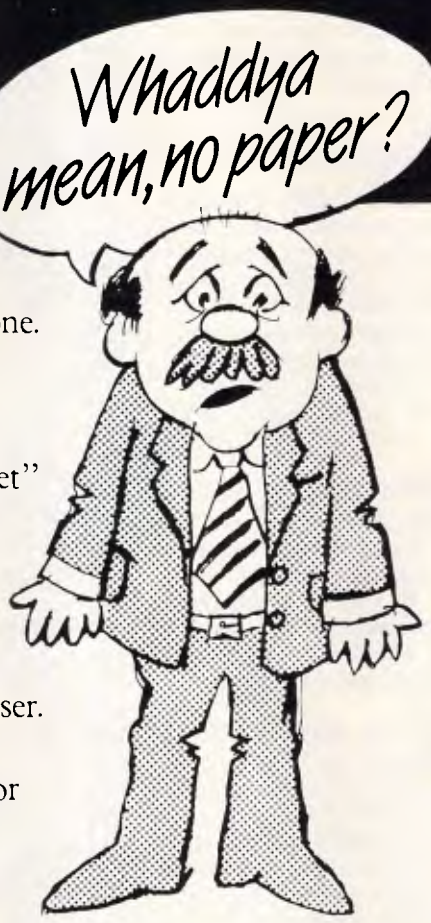

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out that I took the liberty, when writing the Enigma simulation program (Fig 1), of incorporating an 'improvement'. I have included a space character, for which I have used the asterisk (*). As the Enigma requires an even number of characters I have also included the @ character. This character is not used in the program, but it could be used as a control character to toggle boldfact printing or to indicate that the characters following it are to be interpreted as numbers — that is, characters A to J = 1 to 0. From now on, all figures stated in this article will refer to a 28-character Enigma.

Military Enigma

The first step taken to render Enigma suitable for military use was to make the rotors interchangeable and to increase the stock of rotors from three to five. Although only three rotors could be used at any one time, this multiplied the number of configurations by 60. Even with our non-standard 28-character Enigma, this only gives 1,317,120 configurations, which is still not sufficient.

The next modification was really significant, — the incorporation of a plugboard. The plugboard contained sockets corresponding to each of the characters used; by inserting a cable between two characters on the plugboard, those two characters would be swapped both before and after passing through the rotors.

An example of the effect of this modification is that if the swappings (A,X) (J,Y) were used and the A character were enciphered, the effect would be as follows: the A is first transformed into X, the X is then passed through the rotors being transformed into, say, Y, which is finally passed through the plugboard to give J. The point to note is that A becomes X also means X becomes A, thereby preserving the self-inverse property of the machine.

In the early use of the plugboard by the German military, up to seven swappings were used; this was later increased to 10. The program in Fig 1 allows up to 12 swappings The number of ways of swapping 12 pairs of numbers out of 28 is a surprisingly large 647,489,408, 200,000, and is evident that when this number is multiplied by the million-plus configurations of the rotors, the result is a number large enough to render the machine reasonably secure.

A final point concerning the military Enigma is that in order to set the rotors to a given starting position, it was necessary for the rotors to be marked in some way. On the civilian machine they were marked on the outside with

Continued

```
2640  IF LDS = 12 THEN J = K:K = 28
2650  LET OLD = LDS
2660  IF YFLAG = 0 THEN 2680
2670  GOSUB 2860: REM  DISPLAY REMAINDER
2680  NEXT
2690  IF J = 28 THEN 2760
2700  FOR OUT = J + 1 TO 28
2710  IF PBD(OUT) <  > 0 THEN 2750
2720  LET PBD(OUT) = OUT
2730  GOSUB 2350: REM  RECOVER A CHAR
2740  PRINT B$;" SWAPS WITH ";B$
2750  NEXT
2760  LET MODE = 4: GOSUB 1510: REM   INPUT A CHAR
2770  RETURN
2780  REM
2790  REM  PASS THRO PLUGBOARD ROUTINE
2800  REM
2810  FOR J = LO TO HI
2820  LET PTR = A%(J): LET A%(J) = PBD(PTR)
2830  NEXT
2840  RETURN
2850  REM
2860  REM  DISPLAY REMAINDER ROUTINE
2870  REM
2880  LET VP =  PEEK (37): VTAB 23
2890  FOR OUT = 1 TO 28
2900  IF PBD(OUT) = 0 THEN 2920
2910  INVERSE : PRINT " ";: NORMAL : GOTO 2940
2920  GOSUB 2350: REM  RECOVER A CHAR
2930  PRINT B$;
2940  NEXT
2950  PRINT
2960  VTAB VP + 1
2970  RETURN
2980  REM
2990  REM   RESET ROTORS ROUTINE
3000  REM
3010  IF N1 = T1 THEN 3050
3020  GOSUB 1300: REM  INCREMENT ROTOR 1
3030  LET N1 = N1 + 1: IF N1 = 29 THEN N1 = 1
3040  GOTO 3010
3050  IF N2 = T2 THEN 3090
3060  GOSUB 1370: REM  INCREMENT ROTOR 2
3070  LET N2 = N2 + 1: IF N2 = 29 THEN N2 = 1
3080  GOTO 3050
3090  IF N3 = T3 THEN 3130
3100  GOSUB 1440: REM  INCREMENT ROTOR 3
3110  LET N3 = N3 + 1: IF N3 = 29 THEN N3 = 1
3120  GOTO 3090
3130  RETURN
3140  REM
3150  REM  SET RINGS ROUTINE
3160  REM
3170  HOME : PRINT "SETTING RINGS": PRINT
3180  LET N1 = 1:N2 = 1:N3 = 1
3190  FOR L = 1 TO 3
3200  ON L GOTO 3210,3220,3230
3210  PRINT "ROTOR 1 CORE POSTN 1 SET TO -->";: GOTO 3240
3220  PRINT "ROTOR 2 CORE POSTN 1 SET TO -->";: GOTO 3240
3230  PRINT "ROTOR 3 CORE POSTN 1 SET TO -->";
3240  LET MODE = 2: GOSUB 1510: REM  INPUT A CHAR
3250  PRINT A$: PRINT
3260  GOSUB 1700: REM  CONVERT A CHAR
3270  LET B(L) = PTR
3280  NEXT
3290  LET MODE = 4: GOSUB 1510: REM   INPUT A CHAR
3300  REM
3310  GOSUB 3340: REM  POSITION RINGS
3320  RETURN
3330  REM
3340  REM  POSITION RINGS ROUTINE
3350  REM
3360  HOME : FLASH : PRINT "STANDBY POSITIONING RINGS": NORMAL
3370  FOR L = 1 TO 3
3380  IF B(L) = 1 THEN 3470
3390  FOR J = 1 TO 29 - B(L)
3400  ON L GOSUB 1300,1370,1440: REM  INCREMENT ROTORS
3410  NEXT
3420  LET TEMP = 30 - B(L)
3430  ON L GOTO 3440,3450,3460
3440  LET N1 = TEMP: GOTO 3470
3450  LET N2 = TEMP: GOTO 3470
3460  LET N3 = TEMP
3470  NEXT
3480  LET T1 = N1:T2 = N2:T3 = N3
3490  RETURN
3500  REM
3510  REM   INPUT TEXT ROUTINE
3520  REM
3530  HOME
3540  PRINT "ENTER TEXT OF MESSAGE": PRINT
3550  IF RFLAG = 1 THEN LO = HI + 1: GOTO 3570
3560  LET HI = 0:LO = 1
3570  LET RFLAG = 0
```

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characters which could be viewed through windows on the top of the machine. On the military Enigma a further complication was incorporated: each rotor was fitted with a ring marked with 28 characters which, before the rotor was inserted into the machine, could be set so that any character on the ring was equal to a marked core position. This does not increase the actual number of configurations, but it does mean that even if the rotor settings used are known, this does not give away the core positions which are what matter.

Indicators

In order for the Enigma to be used, a system must be devised in order that a person receiving a message knows how to set up his machine to decode the message. One way of doing this would be to issue written instructions to each cipher clerk, detailing in full the machine setting to be used on any particular day. The problem with this is that every message transmitted on a given day will use exactly the same setting, which means that if a particular message needs to be transmitted to, say, all units on the Western Front, then the opposition, receiving numerous intercepts of the same message, would assume that something big was happening and put all its Western Front units on full alert. To avoid this, it is necessary for the cipher clerk to choose a part of the machine setting himself but, in order to do this, a system must be devised to transmit the setting used as part of the transmission; the part of a transmission which is used to indicate how to decode a message is called an indicator.

The actual indicator system used by the Germans in the early days was that the plugboard settings, rotors used and ring settings were laid down in written instructions for the day. In addition, a base rotor position would be included. The cipher clerk would set up the machine according to the laid-down base position (for example, K,M,O), and decide which rotor position would be used to transmit the message (for example, W,E,Q). He would then encipher WEQ twice over, with rotors on the base setting to give, say, JDYFIR, and these six letters would be used as a prefix to the actual message which would be enciphered after the rotors were reset to W,E,Q. The weakness of this system was the element of repetition which mathematicians could exploit to crack the messages.

A later indicator system allowed the cipher clerk to choose the base rotor setting as well as the actual rotor setting. The base rotor setting was then

Continued

```
3580  LET MODE = 3: GOSUB 1510: REM   INPUT A CHAR
3590  IF A$ <  > CHR$ (8) THEN 3620
3600  IF HI < LO THEN 3580
3610  PRINT  CHR$ (8);" "; CHR$ (8);:HI = HI - 1: GOTO 3580
3620  IF A$ =  CHR$ (27) THEN 3690
3630  IF A$ =  CHR$ (16) THEN  PRINT "'";: GOTO 3580
3640  IF A$ =  CHR$ (18) THEN 3690
3650  GOSUB 1700: REM  CONVERT CHAR
3660  LET HI = HI + 1: LET A%(HI) = PTR: PRINT A$;
3670  IF CTR = 1 THEN LO = LO + 1: REM  PLAIN TEXT
3680  IF HI <  > N THEN 3580
3690  PRINT
3700  IF HI <  > N THEN 3730
3710  PRINT  CHR$ (7): PRINT "BUFFER FULL"
3720  LET MODE = 4: GOSUB 1510: REM   INPUT A CHAR
3730  RETURN
3740  REM
3750  REM  SET ROTORS ROUTINE
3760  REM
3770  IF RFLAG = 1 THEN  GOSUB 2990: REM   RESET ROTORS
3780  HOME : PRINT "SETTING ROTORS": PRINT
3790  FOR L = 1 TO 3
3800  ON L GOTO 3810,3820,3830
3810  PRINT "ROTOR 1 SET TO -->";: GOTO 3840
3820  PRINT "ROTOR 2 SET TO -->";: GOTO 3840
3830  PRINT "ROTOR 3 SET TO -->";
3840  LET MODE = 2: GOSUB 1510: REM  INPUT A CHAR
3850  PRINT A$: PRINT
3860  GOSUB 1700: REM  CONVERT A CHAR
3870  LET B(L) = PTR
3880  NEXT
3890  LET MODE = 4: GOSUB 1510: REM   INPUT A CHAR
3900  GOSUB 3930: REM  POSITION ROTORS
3910  RETURN
3920  REM
3930  REM  POSITION ROTORS ROUTINE
3940  REM
3950  HOME : FLASH : PRINT "STANDBY POSITIONING ROTORS": NORMAL
3960  FOR L = 1 TO 3
3970  IF B(L) = 1 THEN 4070
3980  FOR J = 1 TO B(L) - 1
3990  ON L GOSUB 1300,1370,1440: REM  INCREMENT ROTOR
4000  ON L GOTO 4010,4030,4050
4010  LET N1 = N1 + 1: IF N1 = 29 THEN N1 = 1
4020  GOTO 4060
4030  LET N2 = N2 + 1: IF N2 = 29 THEN N2 = 1
4040  GOTO 4060
4050  LET N3 = N3 + 1: IF N3 = 29 THEN N3 = 1
4060  NEXT
4070  NEXT
4080  RETURN
4090  REM
4100  REM   SELECT ROTORS ROUTINE
4110  REM
4120  HOME : PRINT "SELECTING ROTORS": PRINT
4130  FOR L = 1 TO 3
4140  ON L GOTO 4150,4160,4170
4150  PRINT "ROTOR 1 IS -->";: GOTO 4180
4160  PRINT "ROTOR 2 IS -->";: GOTO 4180
4170  PRINT "ROTOR 3 IS -->";
4180  GOSUB 4260: REM  INPUT ROTOR
4190  PRINT A$: PRINT
4200  NEXT
4210  LET MODE = 4: GOSUB 1510: REM   INPUT A CHAR
4220  HOME : FLASH : PRINT "STANDBY INSTALLING ROTORS": NORMAL
4230  GOSUB 4380: REM   INSTALL ROTORS
4240  RETURN
4250  REM
4260  REM   INPUT ROTOR ROUTINE
4270  REM
4280  LET MODE = 1: GOSUB 1510: REM  INPUT A CHAR
4290  GOSUB 1700: REM  CONVERT A CHAR
4300  ON L GOTO 4310,4320,4340
4310  LET B(L) = PTR: GOTO 4360
4320  IF PTR = B(1) THEN  PRINT  CHR$ (7);: GOTO 4280
4330  LET B(L) = PTR: GOTO 4360
4340  IF (PTR = B(1)) OR (PTR = B(2)) THEN  PRINT  CHR$ (7);: GOTO 4280
4350  LET B(L) = PTR
4360  RETURN
4370  REM
4380  REM   INSTALL ROTORS ROUTINE
4390  REM
4400  FOR K = 1 TO 28: READ REF(K): NEXT
4410  FOR L = 1 TO 5
4420  LET DFLAG = 1
4430  FOR J = 1 TO 3 ,
4440  IF B(J) <  > L THEN 4460
4450  LET DFLAG = 0: GOSUB 4510: REM  FIT ROTOR
4460  NEXT
4470  IF DFLAG = 1 THEN  GOSUB 4610: REM  DISCARD DATA
4480  NEXT
4490  RETURN
4500  REM
4510  REM  FIT ROTOR ROUTINE
```

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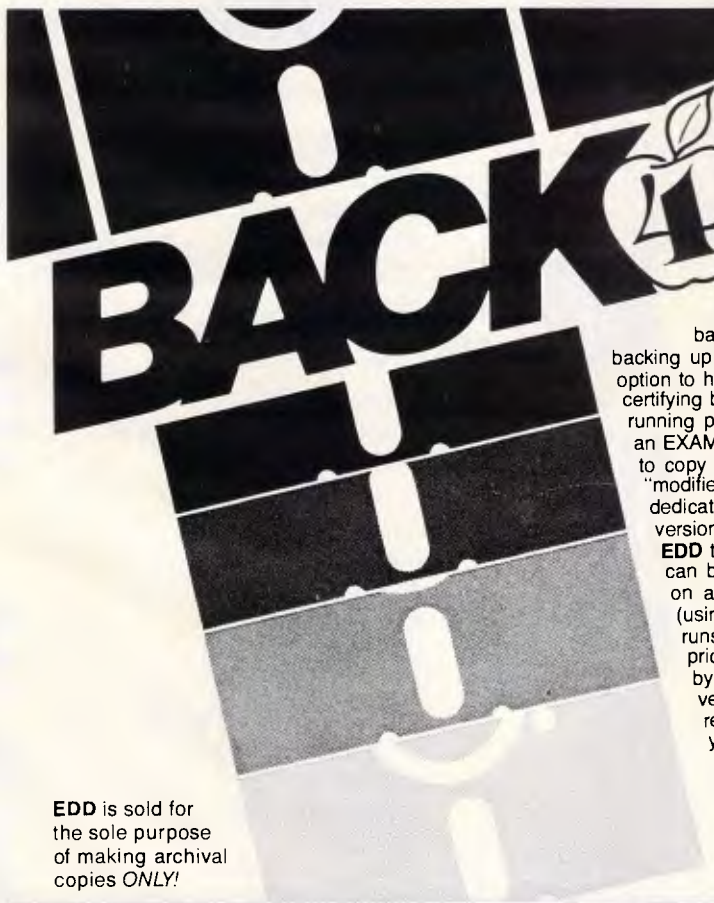

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Continued

```
4520  REM
4530  FOR K = 1 TO 28
4540  ON J GOTO 4550,4560,4570
4550  READ R1(K): GOTO 4580
4560  READ R2(K): GOTO 4580
4570  READ R3(K)
4580  NEXT
4590  RETURN
4600  REM
4610  REM  DICARD DATA ROUTINE
4620  REM
4630  FOR K = 1 TO 28: READ DUMMY: NEXT
4640  RETURN
4650  REM  DATA FOR REFLECTOR WIRING
4660  DATA  23,19,20,14,15,22,11,12,21,24,7,8,17
4670  DATA  4,5,25,13,26,2,3,9,6,1,10,16,18,20,27
4680  REM  DATA FOR ROTOR A WIRING
4690  DATA  26,23,9,28,15,19,4,16,6,12,20,21,22
4700  DATA  14,1,25,10,27,13,17,24,3,2,11,7,18,5,8
4710  REM  DATA FOR ROTOR B WIRING
4720  DATA  8,10,5,13,15,25,1,4,9,28,17,26,12,11,14,24
4730  DATA  22,16,2,19,23,21,27,6,20,7,3,18
4740  REM  DATA FOR ROTOR C WIRING
4750  DATA  12,23,19,7,2,24,1,27,22,14,5,9,15,10,8
4760  DATA  21,11,4,13,16,20,18,6,26,17,28,25,3
4770  REM  DATA FOR ROTOR D WIRING
4780  DATA  13,5,27,9,15,1,10,18,14,19,12,3,24,2,7
4790  DATA  11,4,22,21,28,23,25,26,20,6,17,8,16
4800  REM  DATA FOR ROTOR E WIRING
4810  DATA  19,7,14,16,3,25,12,10,28,1,18,24,6,26,17
4820  DATA  21,22,8,23,11,2,27,4,13,9,15,5,20
```

transmitted as plain text at the start of the message, which would give, using the example quoted in the previous paragraph, the nine-letter indicator KMOJDYFIR. The base rotor positions could be transmitted in plain text because, as stated earlier, a knowledge of the rotor settings is useless unless the ring settings in use are known.

If any reader wishes to use the program in Fig 1 to send cipher messages, I would recommend the second system but without the repetition, giving a six-letter indicator.

Good ciphering

Ideally, you should doubly encipher all messages. At the start of a message, include a random amount of garbage characters and break up long words using an infrequently-used character. Avoid using stock phrases, particularly at the start of a message. It is easy to fall into the trap of thinking that a cipher system is so good that you can start all messages 'From Officer Commanding . . .', but no cipher is that good except for the one time pad method, and even then no good cipher clerk would use it.

If you were to use an indicator system, you should change the system occasionally; perhaps every three months a simple change such as adding a couple of dummy characters before the indicator would be sufficient.

Using the program

When you boot the program disk, you

```
PLAIN TEXT

AS*TODAY*IS*OUR*BELOVED*LEADERS*BIRTHDAY*ALL*TROOPS*WILL*BE*

ISSUED*EXTRA*RATIONS

CIPHER TEXT

CP@XSWHCK@N@LE*XZPR@**VNIOLUFXXX@KKSGPEQLZ*BQHAYBU@KKHTNRXMB

VDQRDHBGLEWPBJZXKBTO
```

Fig 2 The 'challenge' text

```
WJOQOZKRJRQ*UTLSTEOMELKXOEYPPRFKSJPX*U*UVVYVT*UVETZWFZZW*UGZPTPSSE@OZSTCRVEVFNSN
YYBDXHMPTXXVEDOZBITRVCEYMSPDZ*UQFHFWMWSOCYLDRINTMTXEKEJUYMINXOBZDXROYC*URSHNBXKY
JC*GYZLOQIH@LXISGYLLGCIQ@HXN@QHOTHSQED*UTPLGEILFOMW@ZRVKDJMDJT@RBEYSGBQGH*UX@BB@
MLGBIZKEKWJXCGCQGZNPN@*U@TLSQEYTVRFUOZGPSRSKVJ@SFOMWVKRJODZPZR*KFJGWQXGTTM@EET@L
DEFCKWJFYNWDGHBNGKLJ@VMV@IOMBDFRMWDQPCPBCIL@CKNJMYNOHBCDRHXQNTTGIEEECXOK@JNRLF*U
WOHKOJRFYRWTGQITDGSESXPSZ@KTJZHE*USVZMZSYZIXKMJYVVLMDIQTXTDEZEYPPLKQJHS@QM*U*UTQ
DVELGFMZWCLG@DTNPSEQO*U@HRMTCPLEGDNKIJGK@JVG*U@QGGDBBZGY@@LYYH@SXBBFXXWMKIJGWDNY
BGR@KZJVX@CG*UBSN*U@CFP@TDHPEGSZMI*UB@IDVSKGJKMJZHBIYX*UHOSVZXRZO*UHIRSCYSFFZNWZ
LFBQWVH*USKPJHLMBQIKPJDFVIWX@IN*UDTYVOEG*URMXHY@GTDPCEMWWIOG*UYRGFT@WCEX@HGNKNJJ
FF@TDWHEXZMVOFMMWDISGDDLOMPY@RFTLOGEVFRMWY@ZFYDWTQXPESXKKJJKQJ@KVJB*UQVLBFRGWMFP
BWG@DPBI@DIGGKPJCBI@@FNHWTHVGEMB*UHBCFDXWINKQJTYDBEFZRWLXHYM*USZFTDW@E*UKSJM*UHZ
TKDJE*UMGSIWJ*U*UFCZWMVTNZOEDSKRJ*USFPKFPTWXBEGIILYOGV@KRJBX@TYHHEQONGOHLGCRL@LV
N@ZIKKJJFQCWSQPUDSSYB@SCMMHHXNFDDWBZZMII
```

Fig 3 The letter 'A' enciphered repeatedly 1000 times

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will have to set the plugboard. You will be presented with a prompt such as 'A SWAPS WITH—>', to which you reply with a character (A to Z or * or @) — note that A swaps with A means that the plugboard socket is not used. An option is provided to display the remaining characters, which is handy when you are experimenting with the program but it does slow entry speed.

After you have set the plugboard, your next job is to select the rotors. The five rotors are designated with the characters A to E, and the position of the rotors in the machine is determined by the order in which you enter them. Entering A,C,E, for example, would mean that the outermost rotor is A, the middle rotor C and the innermost rotor E.

Next, you set the ring position corresponding to core position one for each rotor by entering one of the aforementioned 28 characters. A similar procedure is necessary to enter the rotor settings to be used, and this completes the setting up of the machine's initial configuration.

You can now enter the text of the message. If you want to transmit plain text as part of an indicator system at the start of the message, this can be toggled using CTRL-P and is indicated on the display by single quotes. Another feature intended for use with indicator systems is the facility to reset the rotors during a message; this is done using CTRL-R. Pressing the space bar generates the * character, and characters may be deleted using the backspace arrow. When you have finished entering the message, you press the Escape key and the machine will encipher the message. Output from the machine can be sent to the screen display or to a printer.

At all times, when using the program, the Escape key is used to move on to the next part of the program, and CTRL-A can be used to abort the program.

I have written the program in (Applesoft) Basic as this is a language that most people are familiar with, and as a result the program runs quite slowly. It takes over 0.6 of a second to encipher each character, which is certainly better than could have been achieved with the original Enigma, although it seems very slow by modern standards.

If you want to use the machine for serious cipher work, a speed increase could be obtained in two ways. The program's bottleneck is in the increment rotors routines between lines 1300 and 1490. If you are familiar with the method used to store arrays on your micro, it would be a straightforward task to write a machine language subroutine to perform this function and call it from Basic. An alternative would be to rewrite the entire program in a more suitable language. If I were to rewrite the program I would use Forth, as that language is particularly well suited to this application.

Conclusion

Here's a challenge: it's the 'easy' one of determining the machine configuration used to encipher a piece of text, given the cipher text and the plain text. This may seem an unreal problem, but it's a situation that often occurs in the real world; for example, it is decided that a certain message is harmless and can be transmitted in plain text, but someone enciphers it. If the opposition can find from this the machine setting used, then the entire cipher traffic for that day would be compromised. The 'challenge' text is shown in Fig 2.

Bibliography

I would recommend readers to study:
— *How Polish Mathematicians Deciphered the Enigma* by M Rejewski;
— *Annals of the History of Computing 3* (1981) by Gordon Welchman;
— *The Hut Six Story* (McGraw Hill 1982); and
— *Alan Turing, the Engima of Intelligence* by Andrew Hodges (Burnett Books 1983 and now available in paperback, published by Unwin Paperbacks)

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David Barrow presents more documented machine code routines and useful information for the assembly language programmer. If you have a good routine, an improvement or conversion of one already printed, or just a helpful programming hint, then send it in and share it with other programmers. Subroutines for any of the popular processors and computers are welcome but please include full documentation. All published code will be paid for. Send your contributions to Subset, APC, 2nd Floor, 215 Clarence Street, Sydney 2000.

COMMENT CASE CONVERTER

Just one Datasheet this month — MC/LCASE, from Russell Greene.

Russell's low-level work is mainly carried out in 8085 code on a Superbrain, using Digital Research's Mac assembler. For some obscure historical reason, probably harking back to the days of desk-size terminals, this otherwise sophisticated software writes all .PRN file comments in upper case — acceptable for short listings, but abominably tiring to read over several pages.

MC/LCASE is a complete program to re-convert the contents of the .PRN file comment field to lower case, except those strings preceded by a special user-defined character. The program has three main sections which (a) read the original file to memory; (b) convert the file in memory; and (c) write the converted file back to disk. Russell has also programmed in error check sequences which abandon the operation and perform a warm restart on disk read or write error.

MC/LCASE is unusual for SubSet in several aspects. It is a complete program and not just a library subroutine, which is perhaps a welcome change as even the best general-purpose routines can be virtually meaningless when seen in Datasheet isolation and not as part of a working program. It is not designed for the whole range of 8085/Z80 computers but written specifically for one system, to deal with a perceived fault in that system's implemented software, and makes full use of system calls. Is it adaptable for other computers built around the 8080 type chip, or, indeed, other processors? It employs both macro and conditional assembly techniques, neither of which can be used in an environment which calls up pre-assembled (machine code) routines. Both of these software tools are all too often unavailable on less expensive assemblers. How useful are they?

Read/write

Disk access is not an intrinsic part of the conversion process, and the read/write sections of MC/LCASE can, of course, be used in any program operating on disk files. The .PRN file which MC/LCASE converts is read from and written to disk by the operating system BDOS — the program supplying the correct parameters in system calls. All the necessary parameters are assigned in equate statements at the start of the program.

Conversion of the read and write sections for other disk operating systems should be quite straightforward. In some cases, only the values equated to the DOS function codes and system constants will need changing.

As the complete file is read in before conversion starts, there should be little difficulty in adapting MC/LCASE to single-tape storage systems.

The straightforward method of load-file, process-file, store-file keeps the programming logic simple and the program short, but could produce problems if the object file were large. Disk storage usually exceeds RAM space, and some assemblers work directly to disk to prevent unnecessary limitation of object program size. (Remember that a full source line reduces to only two or three bytes of object code.) MC/LCASE does not check for a large file overrunning available free memory and eating into system code. Rewriting the program to convert only one or two sectors' worth of listing at a time could prove tricky to code due to split lines, but might be effort well spent if you often work with large source files.

Structure

Ideally, the disk operation and actual file-in-memory conversion sections of the program would be written as separate subroutines, each filed in your subroutine library with distinct Datasheet documentation.

With only minimal rewriting, the conversion section could be further structured to provide several routines, all of which would be useful in any text editing program. Three spring immediately to mind: one to return the start address of each new line; a second which searches for a specific character (in this case ';'); and a third which changes case. Of course, introducing generality in this way always results in longer, slower programs.

Macros

Those of you without a macro assembler will be rather envious of the labour saving made possible by the ability to repeatedly generate sections of code by merely typing in the macro name. I see the greatest benefit as the structure and readability automatically imposed by the (judicious) use of macros — on the source program at least. There are one or two other parts of MC/LCASE that would benefit from macroisation, such as the initialisation of the file control block at addresses 0174 and 0229.

Macros are often much like subroutines in that they can be tested in isolation, guaranteed to work correctly, and stored in a library for use in any program. Where they differ from the type of routine normally found in SubSet is that the assembler will generate code for every occurrence of the macro name. However, by using conditional assembly techniques, it is possible to design a macro that is actually little more than a subroutine call but with greater source program readability.

Once defined, macros become part of an extended instruction set acting on a

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merged processor and system. The ultimate possibility afforded by a macro assembler is the creation of a complete compiled high-level language. This is limited by the assembler's source program format, but has the facility of inserting low-level instructions anywhere without degradation of performance.

Conditional assembly

Although conditional assembly is a useful tool, it can be anathema. The current state of the conditional variable must be known to determine whether the section will be assembled or not; this can often mean checking back several pages to find the last directive which affected the variable.

In MC/LCASE, the subroutine PRINSUB is a necessary adjunct to the macro PRINT, and obviously has to be stored with it in the macro library. Nevertheless, it must be assembled just once in the program as opposed to the rest of the macro code, which is inserted at each occurrence of PRINT. This is achieved by setting a flag (PRINTFLAG) within the conditional section to prevent further inclusion after the first PRINT. The problem with this method is that the conditional assembly flag used has to be initialised in the program and not inside the macro, so the macro cannot be entirely transparent to the host program.

PRINT then only saves the value in DE, loads it with the address of the embedded message and calls PRINTSUB: this in turn saves registers and calls the system's print routine.

The conversion

As you can see, the Datasheet listing is not the normal SubSet non-specific format but an actual converted .PRN file listing to show the effect of the program. This form of self-reference was also used in *APC*, November 1984 with a BBC listing of the BBC assembler formatter, LSTFMT.

MC/LCASE will convert only alphabetic characters from upper to lower case, and only those following the comment field semicolon (;) symbol. All preceding characters in the label, mnemonic and operand fields are unaffected. Full line comments are also unaffected if the asterisk (*) symbol is used initially.

An override symbol, the apostrophe or single quote ('), may be used to prevent selected words (register names, labels, and so on) being converted. In this case a word terminates with a space, so multi-word strings can be selected by one override symbol, provided the word delimeters are not spaces. Two good examples of this facility are in the REG USE section, where the register names are separated only by commas, and throughout the header documentation where TAB characters (not spaces) separate the section title and the first word of information.

The program does suffer some minor problems. Wherever an apostrophe appears in a comment word, all succeeding letters are left in upper case (as the word 'doesn'T' in the ERRORS section).

The use of the character ';' instead of the ASCII value 03BH in the equate COMCHAR line, also fools the program into thinking that the comment starts in the middle of the operand field. The following single quote used to identify an ASCII character is taken as the override symbol and, as only a TAB character separates it and the real comment field, the first comment word remains in upper case.

The override symbol could, of course, be any character, and only the value assigned in the LITCHAR EQU line need be changed. Russell suggests the possibility of using an 'invisible' control code, but recognises that it could cause display problems on different computers.

CP/M Users' Group

Russell is a member of a CP/M users' group, and intends donating a version of this program as a .COM file to the group library. There is a slight difference in the result file of the new version — the single quote is replaced by a space, so watch out for semicolons in the operand field.

DATASHEET

```
=================================================================
=MC/LCASE        MAC.PRN FILE COMMENTS CASE CONVERSION
=================================================================
'JOB    to convert comments in the .prn file produced by
        'DR-"MAC" macro assembler to lower case to improve
        legibility; with optional over-ride.
'ACTION read file into ram, ensuring it is .prn file.
         for each line delimited by carriage return
          [for each character following ";" (comment)
             if it is u/case letter
              [convert to l/case unless
                  [preceeded by user-selected prefix]
                                                      ]
                                                       ].
        write file back to disc.

        'NB: to keep u/case in comment (often useful) the
        string must be prefixed by a special character
        (' in this version; see 'JOB).. but 'MAC accepts "*"
        as comment flag in 1st column and if this is not
        the user selected prefix, all comments so flagged
        remain in u/case (see title line).
-----------------------------------------------------------------
'CPU            8085/8080/Z80
'HARDWARE       WRITTEN on superbrain qd but not machine-
                specific.
                'REQUIRES conversion file to be on disc.
'SOFTWARE       MAC macro assembler specific source program.
                'CP/M-BDOS calls
                'LOCAL subroutine use.
-----------------------------------------------------------------
'INPUT          TAKES <filename> as parameter (supplies ".prn")
                assumes .prn file exists on default disk.
'OUTPUT         WRITES back to same file.
                'EXITS to warm boot on disc read/write error.
'ERRORS         WRITE error could corrupt source file
                (doesn'T write to temp. file & rename if ok).
                'NO check for file > free ram.
'RES use        'AF,BC,DE,HL
'STACK use      allocates 10 bytes local stack.
'RAM use        'SOURCE file length following 'MC/LCASE.
'LENGTH         420 (program 408, storage 2, local stack 10).
                (.com file < 2 'CP/M logical sectors).
'CYCLES         NOT given (depends on file size).
```


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SUBSET

```
                ;-----------------------------------------------------------------------
                ;'CLASS 2        -discreet       -interruptable      -promable
                ;-------         -reentrant      -relocatable        -robust
                ;=======================================================================
                ;
                ;text char equates
                ;
0020 =                  SPACE   EQU     20H
000D =                  CR      EQU     0DH
000A =                  LF      EQU     0AH
003B =                  COMCHAR EQU     ';'             ;COMMENT flag.
0027 =                  LITCHAR EQU     27H             ;user defined flag to identify
                                                        ;strings to be left u/case.
001A =                  EOF     EQU     1AH             ;end-of-file(^z).
                ;
                ;system constants - may be redefined for users system.
                ;
0000 =                  WMBOOT  EQU     0               ;address of warm boot 'JMP.
0005 =                  BDOS    EQU     5               ;address of 'BDOS 'CALL.
005C =                  FCB1    EQU     05CH            ;default file control block.
0100 =                  TPA     EQU     100H            ;'RAM programs base.
0080 =                  SECLEN  EQU     128             ;bytes per physical sector.
                ;
                ;'BDOS functions.
                ;
0009 =                  PRNTLIN EQU     9               ;print string.
000F =                  OPENF   EQU     15              ;open file.
0010 =                  CLOSEF  EQU     16              ;close file.
0014 =                  SEQRD   EQU     20              ;sequential read sector.
0015 =                  SEQWRT  EQU     21              ;sequential write sector.
001A =                  SETDMA  EQU     26              ;set 'DMA
                ;
0000 =                  FALSE   EQU     0               ;cond. assembly flag.
FFFF =                  TRUE    EQU     NOT FALSE       ;cond. assembly flag.
0000 0                  PRINTFLAG       SET     FALSE   ;conditional assembly
                                                        ;flag for macro 'PRINSUB.
                ;
                ;macro
                ;
                PRINT   MACRO   TEXT
                        LOCAL   MSGG,ARND
                        PUSH    D
                        LXI     D,MSGG          ;address print message.
                        CALL    PRINSUB         ;go print through 'BDOS.
                        POP     D
                        JMP     ARND            ;jump to after text.
                        IF      NOT PRINTFLAG   ;conditionally assemble 'PRINSUB.
                ;
                ;print subroutine to be assembled just once.
                ;
                 PRINSUB: PUSH  B
                          PUSH  H
                          MVI   C,PRNTLIN       ;system call to print message.
                          CALL  BDOS
                          POP   H
                          POP   B
                          RET
                          PRINTFLAG SET TRUE    ;prevent subsequent assembly of
                                                ;'PRINSUB subroutine.
                        ENDIF
                MSGG:   DB      TEXT,'$'        ;insert current message.
                ARND:   ENDM
                ;
                        PAGE    0               ;macro directive
                ;
                ;
0100                    ORG     TPA
0100 210000             LXI     H,0
0103 39                 DAD     SP              ;save incoming stack
0104 229802             SHLD    INSTK
0107 31A402             LXI     SP,LOCLSTK      ;and set up local one.
                ;
                ;signon
                ;
010A                    PRINT   'MC/LCASE(05/6) -- lower case conversion
0149                    PRINT   <'of MAC .prn files',CR,LF>
                ;
0169 216500             LXI     H,FCB1+9        ;initialize file type
016C 3650               MVI     M,'P'           ;to "prn".
016E 23                 INX     H               ;this will trap errors
016F 3652               MVI     M,'R'           ;as well as save effort.
0171 23                 INX     H
0172 364E               MVI     M,'N'
0174 AF                 XRA     A               ;initialize 'FCB for opening
0175 326800             STA     FCB1+12         ;..extent
0178 327C00             STA     FCB1+32         ;..record count.
                ;
                ;open file
                ;
017B 115C00             LXI     D,FCB1
017E 0E0F               MVI     C,OPENF
0180 CD0500             CALL    BDOS
0183 3C                 INR     A               ;if 'A was 0ffh then error
0184 CA8801             JZ      OPENERR         ;on opening, so print message.
                ;
                ;read file into memory
                ;
0187 21A402             LXI     H,DMBTART       ;initialize 'DMA pointer to
018A 229602             SHLD    DMPOINT         ;start of free 'RAM after prog.
                READLOOP:
018D 2A9602             LHLD    DMPOINT
0190 EB                 XCHG                    ;'DMA to 'DE
0191 0E1A               MVI     C,SETDMA        ; & set it.
0193 CD0500             CALL    BDOS
                ;
                ;read
                ;
0196 115C00             LXI     D,FCB1
0199 0E14               MVI     C,SEQRD         ;sequential read of one sector
019B CD0500             CALL    BDOS            ;to 'DMA address.
019E B7                 ORA     A               ;sets z-flag if 'A=ZERO=OK read.
019F C2D801             JNZ     CONVERT         ;if 'A not 0 then eof so start
                                                ;the lower case conversion.
01A2 CDB702             CALL    INCDMA          ;bump 'DMA pointer by 1 sector
01A5 C39D01             JMP     READLOOP        ;and read another sector.
                ;
                ;error-on-read message
                ;
01A8                    OPENERR: PRINT  <CR,LF,'No file as parameter - try again',CR,LF>
01D8 C30000             JMP     WMBOOT          ;quit as gracefully as possible.
                ;
                ;examins file byte by byte. after ";" and if u/case and not
                ;flagged to ignore, convert to l/case.
                ;
                CONVERT:
01DB 21A402             LXI     H,DMBTART       ;start of file in memory.
01DE 229602             SHLD    DMPOINT         ;initialize file byte-pointer.
01E1 2B                 DCX     H               ;(for pre-increment in loop).
                ;
                ;new line (probably label or opcode)
                ;
01E2 CDIC02     OP1:    CALL    RCH?            ;inc pointer, load byte to 'A.
01E5 FE1A               CPI     EOF             ;quit if all done
01E7 CA1F02             JZ      WRITFILE        ;and start writing back to disc.
01EA FE3B               CPI     COMCHAR         ;beginning of comment?
```


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```
01EC C2E201             JNZ     OP              ;if not, move along line.
                        ;
                        ;beginning of comment.
                        ;
01EF CD1C02     COM:    CALL    RCH?            ;(dont need to process ";")
01F2 FE0D               CPI     CR              ;end of line?
01F4 CAE201             JZ      OP              ;if so, jump to new line.
01F7 FE27               CPI     LITCHAR         ;flagged to leave as u/case?
01F9 C20C02             JNZ     TXLT            ;if not, convert.
                        ;
                        ;string to be left in u/case.
                        ;
01FC CD1C02     LIT:    CALL    RCH?            ;search for end (space) of
01FF FE20               CPI     SPACE           ;string being left unchanged.
0201 CAEF01             JZ      COM             ;if end, try next character.
0204 FE0D               CPI     CR              ;if not, end of line anyway?
0206 CAE201             JZ      OP              ;if line end, jump to new line.
0209 C3FC01             JMP     LIT             ;else continue search.
                        ;
                        ;convert to l/case.
                        ;
020C FE41       TXLT:   CPI     'A'             ;if less than 'A
020E DAEF01             JC      COM             ;dont convert.
0211 FE5B               CPI     'Z'+1           ;if greater than 'Z
0213 D2EF01             JNC     COM             ;dont convert.
0216 C620               ADI     SPACE           ;convert u/case to l/case.
0218 77                 MOV     M,A             ;replace converted byte.
0219 C3EF01             JMP     COM             ;next byte.
                        ;
                        ;..local subroutine to increment pointer and load byte to reg'A.
                        ;
021C 23         RCH?    INX     H               ;next address.
021D 7E                 MOV     A,M             ;read byte to 'A.
021E C9                 RET
                        ;
                        ;write file back to disc.
                        ;
                        WRITFILE:
021F 21A402             LXI     H,DMSTART       ;reset pointer to start.
0222 229602             SHLD    DMPOINT
0225 3A7C00             LDA     FCBI+32         ;record (=sector) count.
0228 47                 MOV     B,A             ;save it.
0229 AF                 XRA     A               ;re-initialize 'FCB-COUNTERS.
022A 327B00             STA     FCBI+12
022D 327C00             STA     FCBI+32
                        ;
                        WRITLOOP:
0230 C5                 PUSH    B               ;stack record count.
0231 2A9602             LHLD    DMPOINT         ;get 'DMA
0234 EB                 XCHG                    ;in 'DE
0235 0E1A               MVI     C,SETDMA        ;set 'DMA
0237 CD0500             CALL    BDOS
                        ;
                        ;write
                        ;
023A 115C00             LXI     D,FCBI
023D 0E15               MVI     C,SEQWRT        ;write a sector.
023F CD0500             CALL    BDOS
0242 C1                 POP     B               ;pop record count before jumps.
0243 B7                 ORA     A               ;test for write error
0244 C25102             JNZ     WRITERR         ;if 'A not zero.
0247 05                 DCR     B               ;count off one record
0248 CA6B02             JZ      CLOSE           ;and wind up if finished.
024B CDB702             CALL    INCDMA          ;else bump pointer
024E C33002             JMP     WRITLOOP        ;and continue.
                        ;
                        ;error-on-write message
                        ;
0251                    WRITERR: PRINT  <CR,LF,'Disc full'>
0268 C30000             JMP     WMBOOT          ;quit.
                        ;
                        ;wind it all up officially.
                        ;
026B 115C00     CLOSE:  LXI     D,FCBi          ;update disc 'FCB.
026E 0E10               MVI     C,CLOSEF
0270 CD0500             CALL    BDOS
                        ;
0273                    PRINT    OK             ;signal success!
0282 2A9B02             LHLD    INSTK           ;restore system stack
0285 F9                 SPHL
0286 C9                 RET                     ;and exit to 'CCP (hoping file
                                                ;hasn't overwritten it).
                        ;
                        ;.. subroutine to increment  DMA pointer by one physical sector.
                        ;
0287 D5         INCDMA: PUSH    D
0288 E5                 PUSH    H
0289 2A9602             LHLD    DMPOINT         ;pick up last 'DMA
028C 118000             LXI     D,SECLEN        ;and sector byte length
028F 19                 DAD     D               ;calculate next sector address
0290 229602             SHLD    DMPOINT         ;and save it.
0293 E1                 POP     H
0294 D1                 POP     D
0295 C9                 RET
                        ;
                        ;local stack/storage.
                        ;
0296 0000       DMPOINT DW      00              ;'DMA pointer.
                        ;
029B            INSTK:  DS      2               ;system stack pointer saved here.
029A                    DS      10              ;local stack.
                        ;
02A4 =          LOCLSTK EQU     $               ;local stack pointer.
02A4 =          DMSTART EQU     $               ;free memory starts here.
                        ;
                        ;=======================================================
```

WRINKLES

Steven Weller is rather dissatisfied with the way the 68000 returns a 32-bit product for a 16-bit by 16-bit signed multiplication.

Suppose you want a 16-bit result? How can you check for 16-bit signed overflow? He suggests using the code fragment shown in Fig 1.

Is this method good? It is eight bytes long and does use an extra 32-bit register, so is there a better way?

G Lattin likes the Z80's register indirect conditional jumps. What register indirect conditional jumps, you might ask? They are three bytes long, take 22 time states to

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```
:=========================
:
MOVE.W   D0,D1          3200
EXT.L    D1             48C1
CMP.L    D0,D1          B280
BNE.S    OVERFLOW       66dd
:
:=========================
```

Fig 1

jump, 26 not to jump, and use a couple of stack bytes in the process. Most assemblers will only recognise the form similar to that shown in Fig 2.

```
:=========================
:
JZDE   PUSH DE          D5
       RET  Z           C8
       POP  DE          D1
:
JPOBC  PUSH BC          C5
       RET  PO          E0
       POP  BC          C1
:
:.. and so on....
:
:=========================
```

Fig 2

PET HATES

What is it that annoys you most about your processor, instruction set or assembler? How have the designers failed you? What are the programming tricks you have to use to make up the deficiency — or does the problem seem insoluble? If you need answers to your problems, know some of them, or have any information, write to SubSet. END

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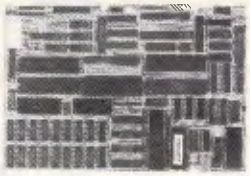

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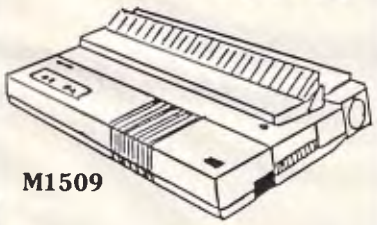

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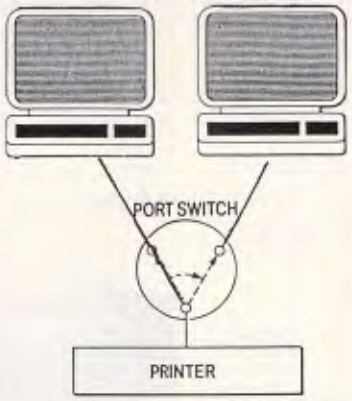

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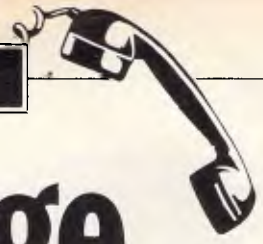

All change

Peter Tootill and Steve Withers throw some light on a subject which can cause confusion to telecomputing newcomers — the various modem standards.

The problem with using ordinary telephone lines to move data around is that the lines are not being used for the purpose for which they were designed, so the data has to be changed into sounds before it can be moved. This is the job of the modem.

There are a number of different modems available. Most of the ones you will come across are designed to comply with a set of standards set down by an international committee called the CCITT (Consultative Committee on International Telephony and Telegraphy). The standards are part of a series called the V series (which covers a range of communications matters, not just modems). The modems in common use on ordinary telephone lines are V21, V22, V22bis and V23. Modems are classified by the speed at which they send and receive data, and this is measured in bits/second. Until recently, the most common modem was a V21 (300 bits/sec) type. This transmits and receives data at 300 bits/sec, which is 30 characters per second (each character requires 10 bits because extra bits are added to the seven or eight used by the standard ASCII code to help the computer decide where the characters begin and end).

During the last year, dual-standard V21 and V23 modems have become popular. V23 works at 1200 bits/sec in one direction and 75 bits/sec in the other. For example, if you were to call Viatel with a V23 modem, the frames would be sent to you at 1200 bits/sec (that is, approximately eight seconds for the whole frame). But if you were to type a request for a new page number, the number would be sent from your terminal to Viatel at 75 bits/sec (about the speed of a good typist). This is a sensible method of working for systems such as Viatel as they are doing all the work.

However, the problem with this rather unequal method (its officially called 'asymmetric') arises when you want to do more than type in a few page numbers.

For example, if you use an electronic mail system, which charges you for each minute you are connected to it, you will want to economise by reducing this time as much as possible. One way of doing this is to prepare messages beforehand, using a word processor, and transmitting them in a block to the system when you call in. This process is often referred to as 'uploading' messages, and most terminal programs include this facility.

However, at 75 bits/sec, uploading is rather slow for anything more than a few words. Both V21 and V23 modems use sounds of different frequencies to represent the binary ones and zeros in the data; this is called 'frequency shift keying' or FSK. In fact four frequencies are used, divided into two channels so that both ends of a 'conversation' can transmit at the same time, without having to wait for the other to finish.

Using frequency shift keying, you can select a new Viatel page before the current one has been completed, or you can send a pause character (usually control-S) to tell a database to pause while you digest the contents of the screen.

Telephone lines don't have a very wide frequency range: the maximum data rate using FSK techniques on dial-up lines is around 1200 bits/sec in one direction only. Recent developments in modem technology have lead to the introduction of 'phase shift key' modulation. In this method, the phase of the signal is changed, as well as the frequency, to encode the data. This allows more than two signals to be used in each direction.

To take advantage of phase key modulation, V22 modems, which work at 1200 bits/sec, in both directions (full duplex), divide the data into pairs of bits (called 'dibits'). A little thought will reveal that there are four possible combinations of two bits, so four types of signal are needed in each direction. Each time the signal changes, two bits of the data are transmitted; therefore, if the signal changes 600 times a second, the data rate is twice this.

The latest type of modem to become widely available uses the CCITT V22bis standard; this uses 'quadbits' to send data at 2400 bits/sec but still at 600 baud. Telecom can provide modems which work at 9600 bits/sec on dial-up lines. With mainframe computer systems, where there is a need to move

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large quantities of data, sophisticated high-speed modems and special lines, which are permanently rented from Telecom, are used. Speeds of many thousands, or even millions of bits per second can be achieved in this way.

System News

The sysops of The Electronic Oracle have resolved the teething problems with their 2400bps service by changing to a different brand of modem! A Dataplex DPX 224 has now been installed, and this manages to detect the speed of incoming calls quickly and correctly.

While on the subject of faster links, the price of higher-speed modems continues to puzzle us. V21/V22 modems currently cost about the same as the cheaper IBM clones with 256k and a single disk drive. The obvious answer is to point to the economies of scale involved, but as modems are built to international standards, very large production runs should be possible (remember that plug-packs can take care of power supply variations). Also, a personal computer involves much more non-silicon hardware in the way of a large case, power supply, disk drive, etc. It's hard to believe that nobody in Taiwan or one of the other homes of cheap electronics can see the potential for a reasonably priced V22 or V22bis modem. Or do the various national telecommunications authorities make it too hard for potential importers of datacomms equipment to gain the necessary approvals?

Thanks to the following people for providing information used in the preparation of this column: Mark Looi, John Halkiadakis, Chris Whitefield, and Grayham Smith.

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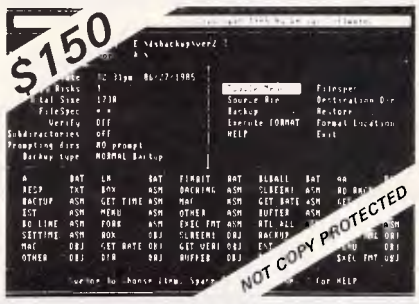

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Phone home

Electronic mail is often presented as the epitome of fast and efficient communication. But while the rapidly increasing popularity of datacommunications is all to the good, we have, argues Surya, still got a long way to go.

Nineteen-eight-six has been heralded the Year of the Modem: electronic mail promises the end of delayed post, lost documents and 'telephone tag'. Online information databases proclaim themselves as the final solution to the need for fast, accurate information. Traditional telex terminals are a dying breed, as even a humble electronic typewriter can be adapted to send and receive telexes. Datacommunications is king.

Last year was something of a celebration period for the datacommunications industry. Electronic mail, once the preserve of large computer companies and a few enlightened individuals, is now almost a household phrase. The modem has been transformed from an expensive mainframe and minicomputer peripheral to a sub-$200 box owned by thousands of ordinary hobbyists. In today's business micro systems, a modem is almost as essential as a printer.

And yet the datacommunications industry can ill afford to sit back and rest on its laurels. The present-day industry is a mass of confusion, inconsistency and disinformation. The very fact that datacommunications is achieving such popularity is indication enough that the time has come to make radical and widespread changes to the way in which the industry operates. The three keywords of its future must be education, standardisation and rationalisation.

Some of the changes I suggest in this article are radical: they will require reorganisation, effort and a willingness to overcome the technical difficulties. Not least, they will require financial investment. But adapting to suit the changing requirements of your customers is hardly a radical move from a marketing viewpoint: it's simple economic sense. For every inexperienced user struggling with the likes of IPSS, there are at least 10 others who have never even considered using any form of computer communications because of the perceived difficulty involved. For every online database user, there are a hundred potential users who aren't even aware of the existence of services which could be saving them time, effort and money. For every electronic mail user, there are thousands of people using antiquated telex machines simply because they believe electronic mail to be complex and uncertain. Not only are these potential comms users deterred now, but the chances are that a great many of them will remain prejudiced even after the changes have been made. The need for action is urgent.

Education

Comms is no longer the exclusive domain of the expert computer user. More and more of today's users are neither experienced nor interested in the technicalities of computing. Their requirements are straightforward: they want a service which is efficient, reliable and, above all, easy to use.

Of course, the actual ease of use of a service is only half the issue; perhaps less than half. At least equally important is the way in which the service is *presented* to the user. A poor advertisement, and potential customers won't even bother to pick up the phone. A muddled leaflet or brochure, and you'll never hear from them again. An incomprehensible manual, and you will hear from them again. And again. And again!

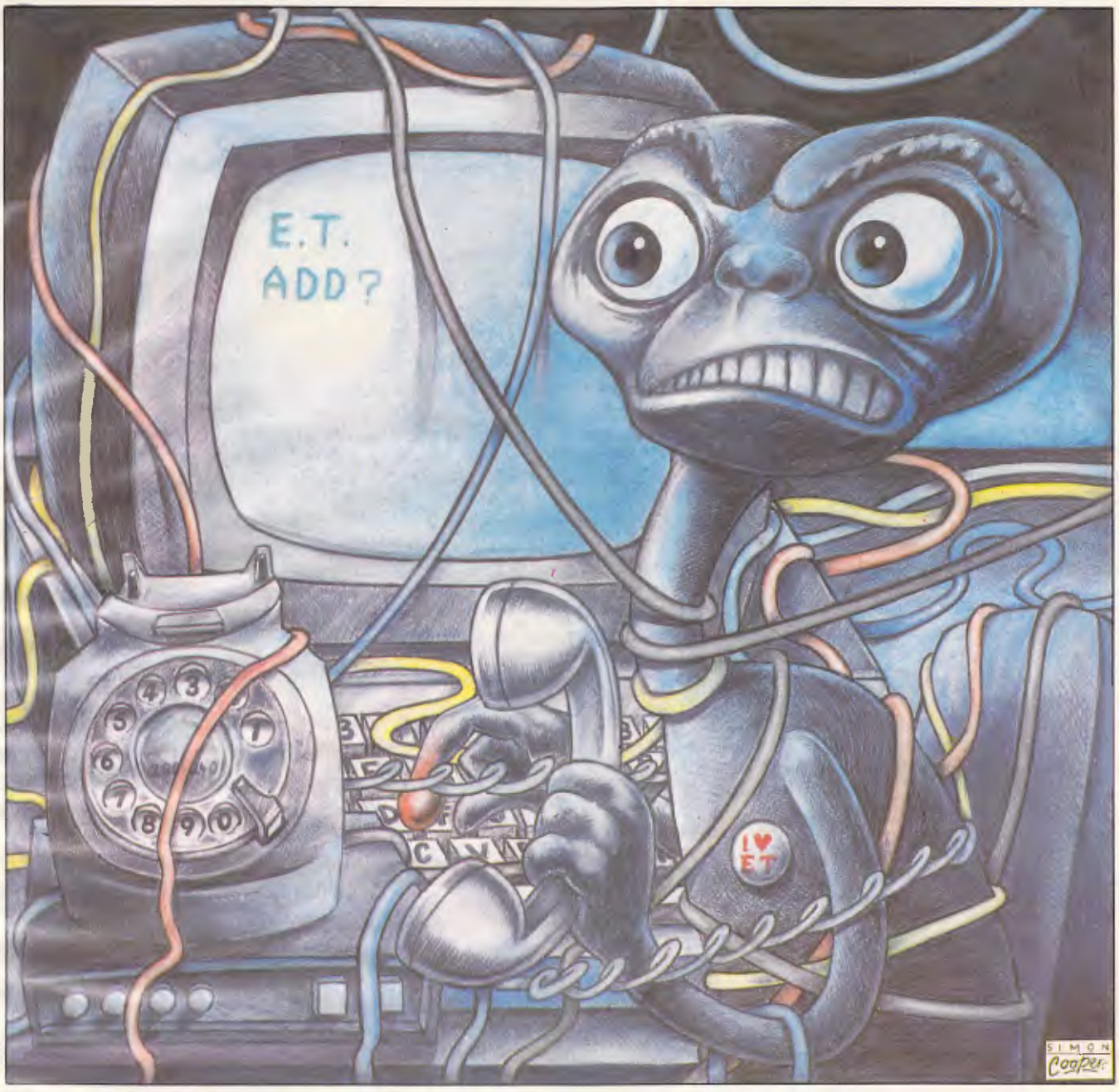
The phrase 'computer literate' has become part of the English language. But while those outside the industry are perhaps beginning to appreciate what computers can and cannot do, comms is still shrouded in mystery, myth and muddle. While most people are aware that electronic mail is the computer equivalent of telex, few appreciate the advantages that it offers. While some are aware that Viatel is an online information service which allows them access to such information as airline timetables, news and weather, few are aware of the vast and varied range of up-to-the-minute information available in this and other information databases.

A significant part of the educative process is simply to present the public with straightforward, accurate information in a comprehensible form. That this commodity appears sadly lacking is a responsibility which must be shared by service providers, software and equipment suppliers, dealers and the press. In a time when the largest untapped market for datacommunications products and services is the naive computer user, advertisements, brochures and manuals for modems, communications software and online services are still being aimed at the professional comms user.

And if jargon such as 'the service is accessed at 300-baud CCITT originate, using eight data-bits, one start, two stop, even parity, Xon/Xoff handshaking with optional XModem protocols and/or EPAD error-checking' isn't enough to deter people, the prices are. And yet, used correctly, dial-up computer services are not spectacularly expensive: the problem is simply one of education.

Let's take the example of an on-line database which offers legal information. With a connect-time charge of $120 an hour, it seems at first glance a very expensive service. But in just 10 minutes service, a lawyer or solicitor can find precedents, search for priors, check references in transcripts... all for just $20. Compare that with the cost of sending an employee to search through volume after volume of crowded text. Think about the possible consequences of not having the information when you need it, and $20 becomes a ludicrously insignificant figure.

Similarly, with electronic mail. A connect charge of 10¢ per minute is an expensive way to send mail if you sit online while you compose replies to your business correspondence. But log off,



write your mail offline using your word processor and then log on again to transmit the completed file,and you can send a message faster than a courier for less than the cost of a stamp. If we are to encourage people to take advantage of computer communications, then education on this level is every bit as important as demystifying the jargon.

But presenting users with clear and accurate factual information is only one of the things needed to convince people that comms can work for them. Equally important is to introduce widespread and sensible standardisation.

Standardisation

Standardisation is arguably the most complex, emotive and confused issue in the entire computer industry. The benefits, in terms of simplicity, convenience and efficient use of resources, are self-evident, and yet these have to be weighed against the equally apparent disadvantages. The two microcomputer standards currently on offer are MSX for the home market, and IBM for business. Neither are anything to write home about. It's an uncomfortable dilemma which will doubtless be with us for a long time yet.

But standardisation of the data-communications industry is much simpler to achieve, and presents far fewer drawbacks. There are really only three baud rates in use, for example: 300, 1200 and 1200/75. And yet one 300-baud service requires eight data-bits, one start and two stop with even parity and Xon/Xoff handshaking, while another demands seven data bits, one start and one stop with odd parity and Sin/Sout protocols. There's no particular gain to be had from either; they are simply arbitrary settings which could be easily changed.

Similarly with modems. The Hayes protocol, a set of standard codes by which comms software can control the settings of a modem, is a great step in the right direction, and thankfully seems to be achieving widespread acceptance. But manufacturers are still continuing to produce modems which require different signals from the computer.

Tandata recently released a beautiful intelligent modem. It's completely automatic, does everything you might ask of it, has built-in memory for storing telephone numbers and is *totally useless* to me because it is controlled using non-standard codes. I can either throw away my existing, Hayes-compatible software and buy Tandata's own package, or buy a less attractive Hayes modem. A friend of mine has the opposite problem. Her auto-answer, auto-dial modem is Hayes-compatible, but her auto-answer, auto-dial software isn't — as she discovered only after buying both. Consequently her system neither auto-answers nor auto-dials.

A compatible modem and software package isn't the end of it, of course. There's that most wondrous of beasts, the RS232 cable. The RS232 cable is, of course, an internationally-agreed standard. Except that we all know that it isn't. My Macintosh has a 9-pin rectangular modem socket. My Tandy 100 has a 25-pin rectangular socket. My modem has a five-pin DIN-socket.

Some machines have male plugs, others have female sockets. Some cables use nine wires, others use seven, five or three. Some carry DTR on one pin, others prefer a different pin; others don't use it at all. Some machines want DCD to be high, others need it low. Some want five volts, others insist on 12.

Creating a standard RS232 socket, cable, power requirement and wiring system is simple. Unfortunately, both CCITT and RS have published incompatible ones, and nobody uses either of them.

We must standardise. When the industry was young, and its relatively few users were quite happy with manual modems, suss-boxes and software configured by typing 1s and 0s against a list of options, a standard was a luxury to be considered in the dim and distant future, if at all, but that future has now arrived. Not only have many of today's users never heard of a suss-box, but those of us who have are becoming increasingly irritated with the frequency of its use.

There's nothing difficult about standardisation. Dial-up services could meet tomorrow to agree on standard settings and protocols for each baud rate and have it in operation the same day. Modem manufacturers and software houses could switch to the Hayes standard with their next releases. Modem and micro manufacturers could adopt standard cables in future machines. It's *not* difficult, it's *not* time-consuming and it's *not* expensive.

Rationalisation

The dictionary definition of rationalisation is 'to make sane', and nowhere is this need greater than in the field of computer communications. Much of this task would be achieved by the kind of standardisation I have mentioned.

For the rest, just look at the many packet switching networks.

All of them operate via unintelligible prompts, cryptic diagnostics and lengthy numeric addresses. The hackers find it easy to navigate through these systems, but to potential business users, it's all too hard. Often, three levels of security, addresses and passwords must be negotiated — MIDAS, TELENET and the end service.

The rational approach is to install a front-end to the system which firstly has a more welcoming and friendlier log-on sequence, and secondly requires you to type in the name of the service you require. An alphabetical list of services can be hash-searched almost as quickly as a numeric one, and it is a simple matter to include a 'near miss' search pattern to take care of mis-spellings and similar.

Electronic mail services need to install similar front-ends to their mail programs. It's ridiculous to have to enter a mailbox number when you could enter a name. Most services offer a facility which allows you to set up your own cross-referencing file so that you can mail regular contacts by name, but this is only a partial solution.

There are problems to this approach, of course. Names are not always unique. And we may not know whether to address mail to an individual or his company. But these problems are nothing new: they already exist, and have been overcome, in user directories. And even a $130 bulletin board system allows me to address mail to a named user.

Online information systems, too, require reorganisation. Free-text searches, tree-style menus and page numbers all have their advantages, and all should be offered in any database system. If I want to take a look at the business software directory on Viatel, for example, I know that this begins on page 666, and typing this page number is the fastest way of getting there. If I want to check out tomorrow's weather, I'm not sure offhand which page it is on but I know that I can find it by following the 'News and Weather' menu tree. If I want to get as much information as I can on a particular species of ant, then I would have no idea where to start, so a free-text search on the name of the species would be my best hope.

Again, there is a need for standardisation as well as rationalisation here. A free-text search is straightforward: I start with a general word such as 'ant' and then qualify it using logical operators (AND, OR, EOR, and so on) until I am left with a manageable number of entries. Or at least it would be straightforward if all databases used the same commands and syntax. They don't, of course.

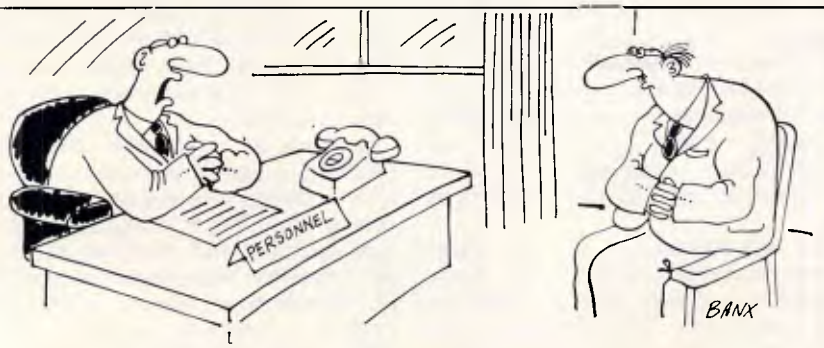
Conclusion

Finally, one of the most fundamental aspects of rationalisation is to ensure that the service offered meets the requirements of its customers. Dial-up services frequently don't. We put up with their shortcomings from necessity rather than choice. Most dial-up services are in their infancy in terms of both ease-of-use and the facilities offered, and many of them bear a closer resemblance to an untidy hotch-potch of miscellaneous features.

It is not my intention to criticise what has been done in the past: rather to point out the changes which must be made in the future. Electronic mail is an excellent means of contacting people, but I can't leave the data equivalent of an answering-machine in my mailbox telling anyone who mails me that I am on holiday and won't receive their message for a fortnight.

Datacommunications has tremendous potential. But only through careful tailoring to its users' needs, can that potential be realised.

END



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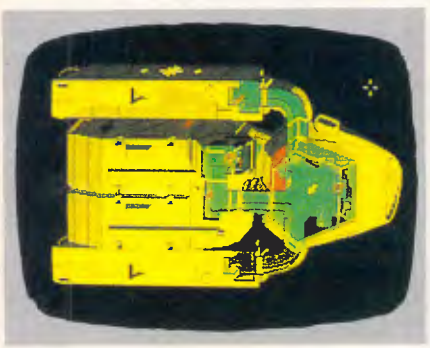
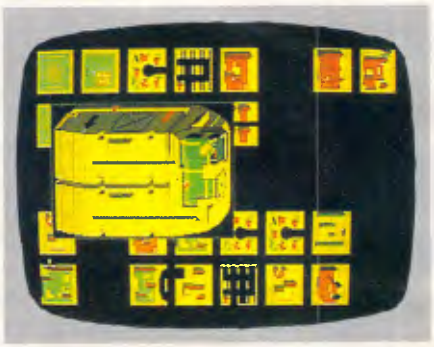
Our choice of leisure software this month gives you the opportunity to establish a colony in an unknown and far-flung location, and pit your wits in the arms race. Stephen Applebaum is at it again.





The burgerland adventure

GAME: Sundog: Frozen Legacy
MACHINE: Atari ST
SUPPLIER: Chambers Computer Suppliers
PRICE: $59.00

The bizarre death of an uncle leaves you as the reluctant owner of the SunDog, a haggard, one-man space freighter. You're also the beneficiary of a contract, signed by your uncle shortly before his untimely death, promising aid for the building of a colony for a religious sect. The death of the signatory does not annul the covenant, and you find yourself in the unfortunate position of having to carry through the operation alone.

Little is known about the sect, or the whereabouts of the colony, named Banville. Your only information is that it's based somewhere on Jondd, one of 18 inhabited planets which make up the Drahew Region of the Jebal Imperial Protectorate.

Locating the colony will provide you with detailed information about the goods required to complete the construction of Banville. The realisation of the town leaves only the problem of transportation of colonists to the colony.

Lack of prescience on the colonists' part has meant that they have diffused their cyrogenically-preserved bodies over the whole Drahew Region, leaving you and your ship with the almost impossible task of tracking them down and transporting them to Banville.

Much of the game's action takes place aboard the SunDog. The interior is graphically displayed in a plan view of the ship, its roof cut away to expose its complex internal workings. Your character is represented by a small stick-man, who can be guided about the craft using the ST's mouse.

Dotted around the SunDog are lockers, store rooms, entrances to engine rooms, and small compartments giving access to the craft's major control systems. Entering any one of these produces a window containing ZoomAction Graphics; in other words, an exploded view of the location into which you have walked.

Your first visit would probably be to the ship's stores to see which provisions are onboard. The locker is stuffed with beefburgers(!), reactofiles (syringes containing a panacea for wounds picked up in combat), a gun, and a shield. All these are depicted in a box, next to which stands an enlarged outline of your character. Strategically-placed crosses adorn the silhouette, identifying areas where objects can be held or carried, and giving an acupuncturist's wallchart effect. One cross, positioned slightly above the heart, represents the spot where the content of a reactofile is administered.

Alongside the box containing the silhouette are four bars which represent various aspects of your man's condition; they indicate levels of vigour, rest, health and nourishment. These are your only guide to the health of your character, and therefore play a major role in his survival.

Below the aforementioned bars is a box containing the word 'sleep'. Just as it says, clicking on this box puts your man to sleep, restoring his rest and vigour to acceptable levels. For reasons I'll mention later, the sleep function should only be activated when you're either inside the SunDog or a hotel.

Towards the front of the SunDog is an airlock which gives access to the external environment. Although exploration on foot is possible, it is advisable to use the self-propelled pod at the rear of the craft. This acts in much the same way as a car, and allows longer periods of exploration, as you do not tire as quickly as you would if you were walking.

Leaving the main bulk of the SunDog behind, you soon find yourself amid the buildings of a major town. Like almost everything else in the game, towns are viewed aerially, giving a clear view of your pod travelling through what appear to be empty streets.

First-time visitors to a town will feel lost for a while, as none of the wierd and wonderful buildings give any indication as to their function. The only way to discover this is to park the pod and explore on foot.

Parking should be done judiciously, as pods left anywhere other than in a podpark are swiftly clamped. Release is procured on payment of a fine made at any one of several local banks. Here, you can also withdraw or deposit cash, depending on your financial requirements.

The clamp is not the only thing which planets of the Drahew Region have inherited from Earth: there is also that great social pastime, mugging. Parks, backstreets and podparks have all become arenas for the sport, making the carrying of a firearm necessary at all times.

Being mugged can leave you penniless and badly wounded, but if you're lucky, it can leave you rich. Mugging the muggers is a good way to make a fast buck, though you must make sure you're properly equipped for the task.

Battling with muggers is one of several arcade sequences in SunDog, and takes place in one of the ZoomAction windows. Before having to zap your way out of a tight spot, you are given the chance to hand over your money, refuse, or even threaten your assailants. Choose the wrong one and the game turns into a typical shoot-'em-up.

A much easier way to lose your money is to fall asleep in public. This happens quite regularly, unless you keep a keen eye on your character's condition, guiding him back to the pod or into a hotel whenever he looks as if he is about to nod off.

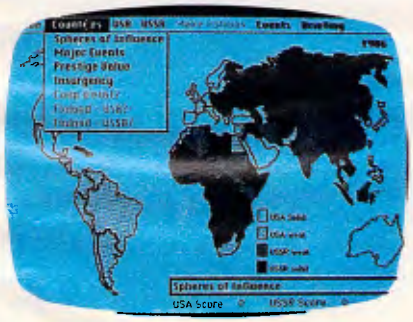
Buildings which are almost as important as the bank are the burger bars. Not only can you stock up on food here, but also chew over snippets of information elicited from other customers. And for the junkies among us, burger bars are also good places to pick up the odd drug.

With all the various places to visit in town, it's easy to lose sight of your target — the warehouse. This is the trading hub of the town, and the only building which can be entered while you're still in the pod. Inside, you have the chance to buy and sell goods picked up anywhere on the planet or even another part of the Drahew Region of planets.

Your initial search for Banville will take you out of the relative safety of town, and across the torrid dust bowls of Jondd. The journey is long, and a great deal of food is required if you are to stay alive long enough to reach your goal; the more devious the route, the less chance you have of survival.

Constructing Banville is a simple task compared to the search for the dyrogens; this enterprise takes you out across the infinite vacuum of space and into often hostile territory. Frequently you'll be attacked by enemy craft, the action taking place in a sub-Space Raiders shoot-out, the graphics of which are way below the standard of the rest of the game.

SunDog has its weak points, such as: poor scrolling as you travel across a planet's surface; the poor space combat sequence mentioned above; the improbably yet frequently-occurring event of a pod parking on top of your own, only moving when you walk off the screen and then return to your vehicle (a bug, possibly?); and a scanty, uninformative manual. Even so, its superb graphics and sound, sense of fun and space-age adventure, make SunDog a game which deserves anyone's time and attention.



If I ruled the world

GAME: Balance of Power: Geopolitics in the nuclear age
MACHINE: Macintosh, IBM PC
SUPPLIER: Imagineering
PRICE: $79.95

The possibility of nuclear war is a fear that haunts most of us. It is the thought of something so peremptory, so final, so out of our hands, which gnaws at the back of our minds. What would *you* do if you were in power? Dismantle all nuclear weapons, call for a moritorium on deployment, or continue on the same nuclear merry-go-round which current world leaders seem to have found themselves on?

None of us will ever be in a position to make these decisions, but at least we can get an idea of what it would be like, by playing Chris Crawford's apocalyptic Balance of Power.

In the Options menu of Balance of Power, Crawford states: 'Your goal in this game is to increase the geopolitical prestige of your chosen superpower while avoiding a nuclear war.' As leader of either Russia or the US, it is up to you to present policies which will further the interests of your own nation, but not be so extreme as to precipitate a nuclear war. All this takes place in a world where Russia and the US are able to control the internal workings of almost any nation, these beleaguered countries being viewed only as pawns in a sick game of political chess.

Play, if you can call it that, takes place on one of four levels. For the newly-elected leader there's a special beginner's level with its streamlined set of policies; then there's the expert and intermediate levels; and above them, a special Armaggeddon-assured nightmare level. I have confined this review to dealing with the expert level, as it contains every feature available in the game, without becoming unplayable.

Balance of Power is played on a map featuring 62 of the world's 'more important' nations. Above this map, in a menu bar across the top of the screen, are seven headings, reading: Game, Countries, USA, USSR, Make Policies, Events, and Briefing. As most of Balance of Power revolves around these seven menus, the best way to describe the game in play is to reveal the contents of the more important ones.

To be successful in Balance of Power, you have to know who your friends are. The Countries menu allows you to check this at any point in the game, by providing vital information on all non-superpowers. The 'Spheres of Influence' option, for example, indicates which countries are influenced by either Russia or the US. Those that are under the influence of 'the other side' should not be

messed with, though those that are not influenced by *either* side could always be persuaded to come under your wing.

Also in the Countries menu is a sub-heading called 'Major Events'. As it suggests, this menu outlines any major events that took place during the previous year; Balance of Power encompassing eight years.

Below Major Events are five other sub-groups: 'Prestige Value', 'Insurgency', 'Coup d'Etat', 'Finland-USA?' and 'Finland-USSR?' Prestige Value displays the prestige value of each country, while Insurgency presents the state of insurgency. The other three sub-groups need a little more explanation.

Coup d'état is a term used to describe the overthrow of a government through purely political means. Selecting Coup d'état? presents the likelihood that a nation's government will go through this process.

Finlandisation occurs when a nation finds itself in political and military dire straits. At the point where it could be crushed, the weaker nation adjusts its political position, making it less hostile to its would-be invader; the result is that it adopts a similar diplomatic position to that of its enemy. Any nation which takes this path is said to have 'Finlandised'.

The menus headed USA and USSR contain information covering the two nation's policies and their relationships with the rest of the world.

Make Policies is the menu most frequently accessed in the game: it is from here that you can put your policies into operation. Military aid can be sent to different countries, help can be given to insurgencies, or you can intevene on behalf of a country's government or rebel forces.

Countries can be destabilised by sending in 'spooks'. In the case of the USA these are CIA agents, while the USSR would use its KGB.

When a player has made all the policies that he wishes to make, he opens the Game menu and clicks on 'next turn'. Before moving onto the next year, you have to go through a number of crises; these are complaints made by the opposition about your policies over the preceding year. You can challenge these, but if your adversary feels strongly enough, you may have to threaten him. Backing down at the last minute could mean a dramatic loss of prestige, while pressing 'on' can precipitate nuclear war. What will you do?

Unfortunately, due to lack of space, this review can only be considered an outline of Balance of Power. The game is too vast and contains too much information to be covered as deeply as it could be, though I hope this short description has sufficiently whetted your appetite.

Nuclear war is a horrifying prospect which hangs over all our heads like the proverbial Sword of Damocles. Seeing the subject used as material for a computer game, therefore, makes me wonder whether it is right to trivialise such an important matter for entertainment's sake. Nothing is so ineffable that it cannot be spoken about, or at least it shouldn't be, but the belittling of such an important matter by turning it into a computer game detracts from the seriousness of the issue.

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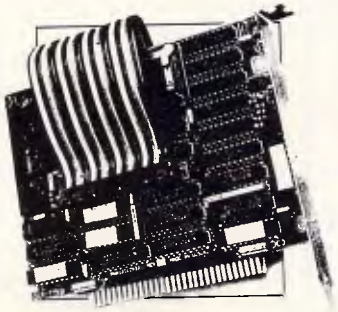

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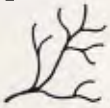

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Brain-teasers from J J Clessa.

Quickie

No prizes, no answers, but which of the following words is the odd one out? Laughing, Mangled, Default, Thirsty, Canopy.

Prize puzzle

A certain nine-digit number is comprised of each of the digits 1-9. If the number is divided by one of the digits, it gives an eight-digit quotient which contains each of the remaining digits.

If I tell you that the original number does not end in 8, can you tell me what it is, and what is the digit by which it must be divided to satisfy the above requirements.

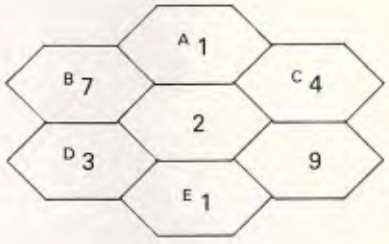
Answers on postcards, please, or backs of envelopes, to reach us not later than 15 July 1986. Send your entries to Lazing Around, June Prize Puzzle, *APC*, 2nd Floor, 215 Clarence Street, Sydney, 2000.

March prize puzzle

Most readers spotted the deliberate mistake in the March puzzle. Since you've all been complaining that the problems are too easy, I thought I'd slip a crafty error into one of the clues. Keep your eyes peeled.

The winner is Mr D Wares of Beverley, WA. Congratulations, Mr Wares — your prize is on its way.

The winning solution is:



MICROCHESS

It could only happen in chess. Kevin O'Connell describes Belle's sad defeat in the 15th North American Computer Championship.

Some time ago my company was programming a game that is rather obscure and about which we had little in-house knowledge. So we hired some experts on the game and picked their brains for heuristics that our programmers could use. When the program was written and debugged, we brought the experts back to assess the program's playing ability. Occasionally the experts would ask: 'But how can it possibly make such a dreadful move?' and were never at all amused by the reply: 'Because you told the program to play like that.' It is just that dreadful rejoiner which answers the question of how Belle, world champion 1980-1983, could possibly lose the following game, having gained queen for a mere two pieces. The game was played in the 15th North American Computer Championship, San Francisco 1984.

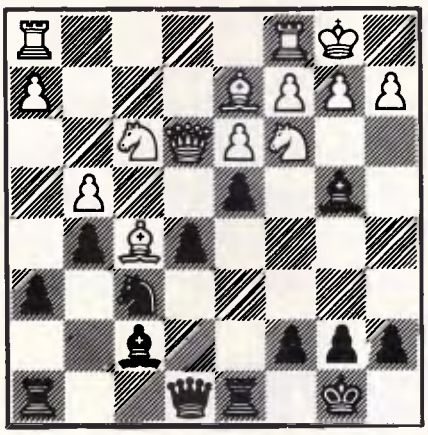
White: Belle. Black: Nuchess. Opening: Sicilian Defence.

1	e2-e4	c7-c5
2	c2-c3	e7-e6
3	d2-d4	c5xd4
4	c3xd4	d7-d5
5	Bf1-d3	

5 e4-e5 is better. This move loses time.

6	Bd3xe4	Ng8-f6
7	Be4-c2	Nb8-c6
8	Ng1-f3	b7-b6
9	0-0	Bc8-a6
10	Rf1-e1	Bf8-b4
11	Nb1-c3	0-0
12	a2-a3	Bb4-e7

A fairly typical isolated d-pawn position, although it is very unusual to reach one from this opening — it normally arises from d-pawn openings or from the Caro-Kahn Defence (1 e2-e4 c7-c6). White has more space and some attacking possibilities; Black has the d5 square and the weakness of White's d-pawn to balance the chances.



Chessboard 1

13	Bc1-g5	Qd8-d6

Better 13 . . . Ra8-c8

14	b2-b4	Ba6-c4
15	Nf3-e5	b6-b5?

Black should have played 15 . . . Nc6xe5 16 d4xe5 Qd6xd1 which leaves White rather better, but the text should have lost.

16	Bg5xf6	Be7xf6

Or 16 . . . g7xf6 17 Ne4xc6 Qd6xc6 18 Bc2xh7+! Kg8xh7 (18 . . . Kg8-h8 19 Qdl-h5 or 18. . .Kg8-g7 19 Qd1-g4+ transposing to one of the other two lines) 19 Qd1-h5+ Kh7-g7 20 Qh5-g4+ Kg7-h8 Re1-e3 and Black has no defence against the threat of Re3-h3 mate.

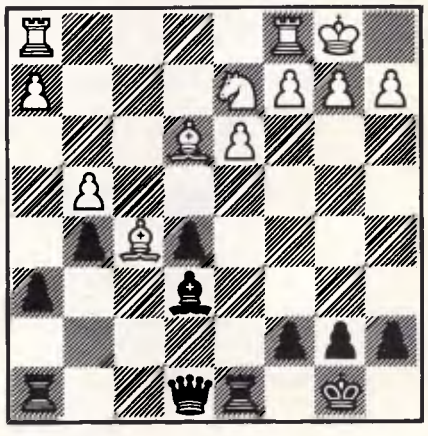
17	Nc3-e4!	Bf6xe5

There is nothing better. 17 . . . Qd6-c7 allows 18 Ne4xf6+ g7xf6 19 Bc2 xh7+ and so on.

18	Ne4xd6	Be5xd6
19	Bc2-d3	

19 Bc2-e4, followed by 20 d4-d5, is best, but there is nothing wrong with the text.

19	. . .	Nc6-e7
20	Bd3xc4?	



Chessboard 2

This apparently harmless, indeed logical, move (when ahead, exchange pieces) is the source of all White's subse-

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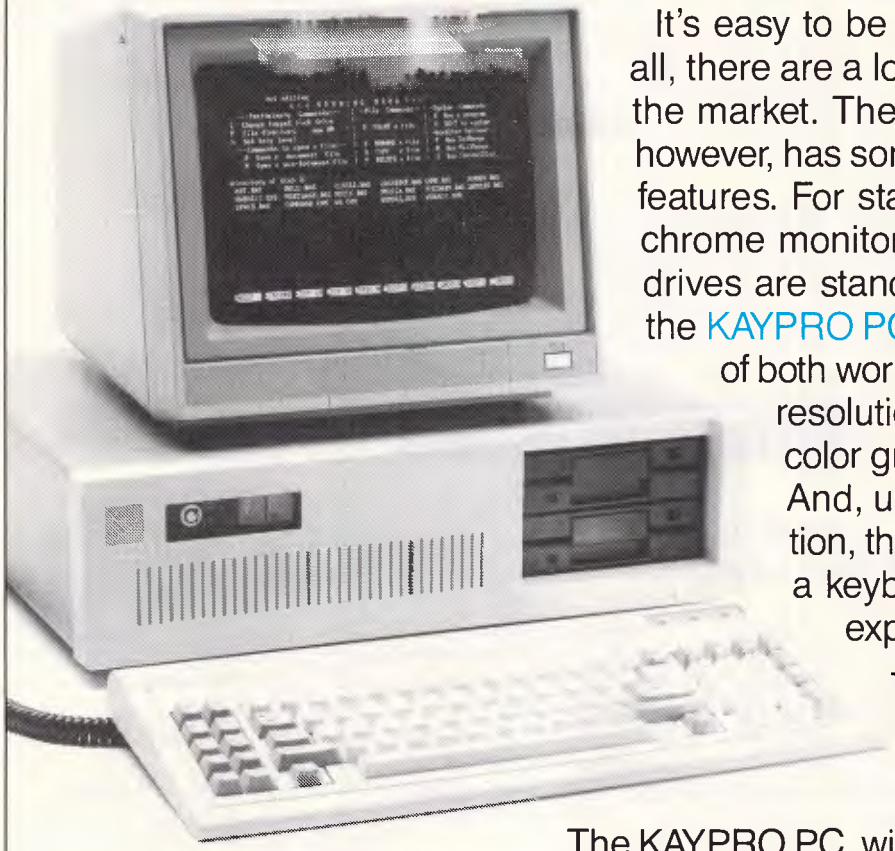

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quent difficulties. White should not voluntarily create a strong, passed c-pawn for the opponent, especially since it is apparent from the subsequent course of play that Belle has no idea what to do about it.

The correct course of play is 20 Ra1-c1 Ra8-c8 21 Qd1-e2 when Black is forced to exchange on d3.

20	. . .	b5xc4
21	Ra1-c1	Ra8-c8
22	Qd1-e2	c4-c3
23	Qe2-a6	Bd6-f4
24	Rc1-c2	Rc8-a8

24 . . . Rc8-c7 would be more normal and better.

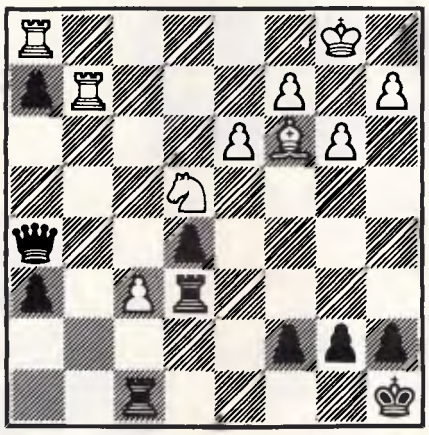
25 Qa6-b7?

This was the first of Belle's many opportunities still to play for a win with 25 Rc2xc3 Bf4-d2 26 Re1-c1 Bd2xc3 27 Rc1xc3.

25	. . .	Ne7-d5
26	Re1-e2	

From here, until Black plays 35 . . . a7-a6, practically every single move, by both sides, should be given a question mark. Both programs play the most appalling rubbish.

26	. . .	Bf4-d2
27	Qb7-a6	g7-g6
28	Re2-e4	Rf8-c8
29	Kg1-h1	Rc8-f8
30	Re4-h4	Bd2-g5
31	Rh4-h3	Bg5-e7
32	Qa6-a4	Be7-f6
33	Rh3-d3	Rf8-d8
34	b4-b5	Rd8-b8
35	Rc2-c1	a7-a6



Chessboard 3

Black is the first (and only) to break out of the pit.

36	b5xa6	Rb8-b6
37	a6-a7	Rb6-b7
38	Rc1-a1?	

If there were an escape route for the white king, then taking on c3 with either rook would be adequate for White. But there is still a way out with 38 Qa4-c6, followed by taking on c3, and White should not lose.

38	. . .	Ra8xa7
39	Qa4-d1	Rb7-b2!

Still with only bishop and knight for queen, Black is now clearly on top.

40	f2-f3	c3-c2!
41	Qd1-f1	Bf6-g5
42	g2-g3	Ra7-b7!

The end is nigh.

43	f3-f4	Rb2-b1
44	Rd3-f3	Bg5-f6
45	f4-f5	Bf6xd4
46	Ra1xb1	c2xb1=Q

0-1 (White resigned)

END

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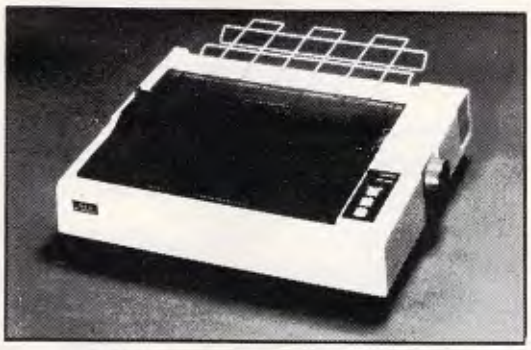

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NUMBERS COUNT

Following up on the enthusiastic response given to Mike Mudge's musings on Perfect and Tri-perfect Numbers, this month he captivates you further with Sociable Numbers.

Definition (i). The *Aliquot Divisors* of a positive integer, n, are all of its divisors except for n itself. s(n) is used to denote the sum of these aliquot divisors of n.

(ii) If s(n) = n, then n is said to be a *Perfect Number* (see 'Numbers Count', November 1983 & April 1984).

For example: if n = 28, then the aliquot divisors are 1, 2, 4, 7 and 14 from which it is readily seen that s(28) = 28.

(iii) If s(m) = n and s(n) = m, then m and n are said to form an *Amicable Pair.* In this case $s(s(n)) = s^{(2)}(n) = n$, where s is considered as an operator acting upon a positive integer.

For example: if n = 220, then the aliquot divisors are 1, 2, 4, 5, 10, 11, 20, 22, 44, 55 and 110, so that s(220) = 284. The aliquot divisors of 284 are 1, 2, 4, 71 and 142 whose sum is 220, thus $s^{(2)}(220) = 220$, and 220 and 284 are an amicable pair.

(iv) If s(m) = 2n, then n is said to be *Triperfect.*

The operator s can now be iterated; that is, applied repeatedly to a given positive integer, n.

(v) The numbers in the set $n_1, n_2, n_3, \ldots n_k$ are called *Sociable Numbers* with *Index* k, if and only if:

$s(n_1) = n_2$
$s(n_2) = n_3$
.....
$s(n_{k-1}) = n_k$
$s(n_k) = n_1$

For example: 12496 1s is a Sociable Number with Index 4 because: s(12496) = 14288, s(14288) = 15472, s(15472) = 14536 and s(14536) = 12496.

It can be readily verified that 14316 is a Sociable Number with Index 28.

Until 1918, two sets of sociable numbers with indices 5 and 28 were known; reference P Poulet, 1918, *Intermed Math* (vol 25, page 121). H Cohen, reference 1970, *Math Comp* (vol 24, page 423) has conducted an extensive search for sociable numbers with index less than, or equal to, 10, of which the smallest member of the set is less than 60000000. This search has revealed nine new sets of sociable numbers with index '4' and has led Cohen to the interesting conjecture that there exists an infinity of sociable numbers with index 4.

Problems (A) Rediscover Cohen's nine sets;

(B) Iterate the function s(n) for any arbitrary starting integer n_0, and hence find the index of sociability of n_0; and

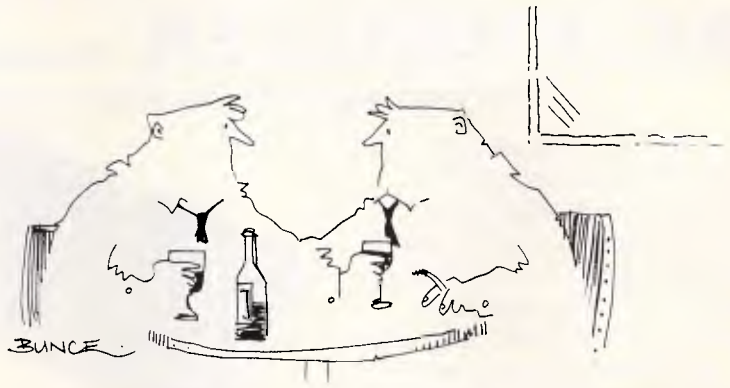
(C) Generalise the concept of sociability in some way: for example, by redefining the function 's' as the sum of the even (or indeed the odd) aliquot divisors; or perhaps excluding aliquot divisors of the form p^n where p is prime.

Readers are invited to submit their attempts at some (or all) of the above problems to: Mike Mudge, C/- *APC*, 2nd Floor, 215 Clarence Street, Sydney 2000.

Submissions which must reach me by 25 July 1986, will be judged using suitably vague criteria. A prize will be awarded for the best entry received.

Please note that submissions can only be returned if a suitable stamped addressed envelope is provided.

END



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BENCHMARKS

A list of Benchmarks used when evaluating micros is given below. An explanation can be found in the February '84 issue.

```
100 REM Benchmark 1
110 PRINT "S"
120 FOR K=1 TO 1000
130 NEXT K
140 PRINT "E"
150 END
```

```
100 REM Benchmark 2
110 PRINT "S"
120 K=0
130 K=K+1
140 IF K<1000 THEN 130
150 PRINT "E"
160 END
```

```
100 REM Benchmark 3
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/K*K+K-K
150 IF K<1000 THEN 130
160 PRINT "E"
170 END
```

```
100 REM Benchmark 4
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 K<1000 THEN 130
160 PRINT "E"
170 END
```

```
100 REM Benchmark 5
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 GOSUB 190
160 IF K<1000 THEN 130
170 PRINT "E"
180 END
190 RETURN
```

```
100 REM Benchmark 6
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GUSUB220
170 FORL=1 TO 5
180 NEXTL
190 IF K<1000 THEN 140
200 PRINT "E"
210 END
220 RETURN
```

```
100 REM Benchmark7
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB 230
170 FOR L=1 TO 5
180 M(L)=A
190 NEXTL
200 IF K<1000 THEN 140
210 PRINT "E"
220 END
230 RETURN
```

```
100 REM Benchmark 8
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K 2
150 B=LOG(K)
160 C=SIN(K)
170 IF K<1000 THEN 130
180 PRINT "E"
190 END
```


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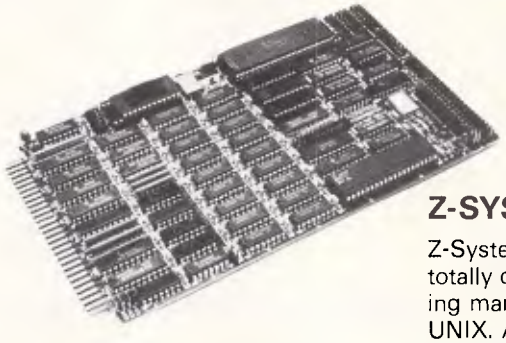

HD64180

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USER GROUPS INDEX

Below is a complete list of User Groups known to us in Australian and New Zealand. User Groups' Secretaries are asked to provide us with alterations, additions and corrections as promptly as possible to avoid a longer than necessary delay before publication. During the next seven months these changes will be published and the next complete listing will appear in the December issue of APC.

NAME OF GROUP:	CATERING FOR:	MEETINGS:	CONTACT:
NEW SOUTH WALES			
Albury/Wodonga MicroBee User Group	MicroBee	Meetings are held on the 1st Monday of the month (except January), at the Albury High School, 7.30pm.	Eric Eulenstein 202 Kooba Street Albury NSW 2640
Ausborne User Group	All computers compatible with Osborne.	Every 3rd Wednesday of each month at the Burwood RSL, 96 Shaftsbury Road, Burwood, NSW, beginning at 6.30pm.	The Secretary PO Box C530 Clarence Street Sydney NSW 2000 (02) 438 7084 Bulletin Board: AUSBOARD (02) 439 7072
Bathurst Computer Group	General	Meetings are held on the 2nd and 4th Friday of each month during school terms at 7.30pm at West Bathurst Public School.	Liz Haddon Secretary Bathurst Computer Group 10 Uralla Circuit Kelso NSW 2795
Bay User Group	Commodore 64/128	Meets on the last Thursday of each month, between 5 and 7pm at Nelson Bay High School.	Wayne Herring Secretary PO Box 308 Nelson Bay NSW 2315
Blakehurst Computer College	BBC	Meets on the last Thursday of each month at the Blakehurst Computer College, 642 Princes Highway, Blakehurst.	Lee Hourigan (02) 546 7399
Blue Mountains Homebrew Computer Club	General	Meets at members' homes.	Eric Lndsay 6 Hillcrest Avenue Faulconbridge NSW 2776 (047) 51 2258
Campbelltown User Group	General	—	Ernest P Leseberg 75 Lithgow Street Campbelltown NSW 2560
Cat User Group	Dick Smith Cat	—	Secretary Cat User Group 71 Milson Road Cremorne NSW 2090
Central Coast Apple User Group	Apple and compatibles	The group meets on the first Tuesday of each month at the Central Coast Grammar School, Erina Heights from 7.30pm.	Charles Lee (043) 67 6845 or Mick Tierney (043) 41 9350
Challenger User Group affiliated with Sydney PC User Group	Dick Smith Challenger	Meets at the 4th floor, Standards House, 80 Arthur Street, North Sydney on the second Tuesday of each month beginning at 5.45pm.	Geoffrey Towns (02) 929 4618
Dapto BBC User Group (DBUG)	BBC	The club meets at 7pm on the last Wednesday of each month at 3/74 Princes Highway, Dapto NSW.	DBUG PO Box 447 Dapto NSW 2530
Eastern Suburbs Commodore	Commodore	Meets every 2nd Monday at 8pm, at the State Emergency Service Building, at the rear of 1355 Botany Street, Botany.	R Kellaway Secretary 10 Erang Avenue Kirrawee NSW 2232
80 Gamer User Group	TRS-80, System 80 and Color Computer users.	—	Jim Fisher 37 Fairburn Avenue West Pennant Hills NSW 2120
Gosford Commodore Computer Users (GOSCOM)	General	Meetings are held every 3rd Wednesday of the month at 7.30pm at the Library of East Gosford Public School, East Gosford.	The Secretary GOSCOM PO Box 86 Umina NSW 2257
Great Western User Group	General	The club meets on the 1st Tuesday of each month, 8pm at the Greystanes Community Hall, Merrylands Road, Greystanes NSW 2145.	Secretary Great Western User Group PO Box 210 Wentworthville NSW 2145 (02) 631 2066 or (02) 636 9219
Hitachi/6809 User Group	Hitachi/6809	Meets at 2pm, 1st Saturday of each month.	Rob Lohr President Hitachi/6809 User Group PO Box 966 Bondi Junction NSW 2022 (02) 662 4150
Hunter User Group	General	Meets at University of Newcastle, Room W308 Education Building on the 2nd Wednesday of each month at 8pm.	Secretary Hunter User Group PO Box 39 Broadmeadow NSW 2292

USER GROUPS INDEX

NAME OF GROUP:	CATERING FOR:	MEETINGS:	CONTACT:
Illawarra IBM PC Club	IBM and compatibles	—	Secretary Illawarra IBM PC Club C/- John Lysaght (Aust) Ltd Delivery Code 29 PO Box 77 Port Kembla NSW 2505 (042) 75 6721
Macarthur Computer Users Association	General	Meets on the 1st Monday of each month at the Airds High School Library, Briar Road, Campbelltown, 7.30pm.	J Napier 23 Athel Tree Crescent Bradbury NSW 2560
Lismore C-64/128 User Group	Commodore 64	Meets on the 2nd Monday of each month at Kadina High School Library, commencing at 7pm.	Lismore Commodore 64/128 Computer Enthusiasts PO Box 385 Lismore NSW 2480 (066) 21 4054
OZBEEB	BBC	The group meets twice a month at the Australian Film and Television School — Open Program, 3 Lyon Park Road, North Ryde. A general meeting takes place on the 4th Monday of each month at 6.30pm.	OZBEEB PO Box 1030 Parramatta NSW 2150
Spellbinder User Group (SBUG)	Apple	The group meets on the 4th Monday of each month, 6pm at Room 9, Ground Floor Trades Hall, corner of Dixon and Goulburn Streets, Haymarket.	Kathie Hanson PO Box 171 Matraville NSW 2036 (02) 694 1523
Sydney MicroBee User Group	MicroBee	Meets on the 3rd Saturday of each month in the Assembly Hall at Strathfield Girls High School, Albert Road, Strathfield from 1pm until 4pm.	Ron Taylor Secretary PO Box C233 Clarence Street Sydney NSW 2000 (043) 41 5251 (after 7pm)
TISHUG	Texas Instruments Professional, TI-994A and other 16 bit TMS9900-based personal computers.	—	John L Robinson Secretary PO Box 149 Pennant Hills NSW 2120 (02) 848 0956
Tuggerah Lakes Commodore User Group	Commodore 64	The group meets at the old Primary School Wyong (opposite Wyong Plaza), on the 1st and 3rd Thursdays at 6.30pm.	Frank James 125 Woolana Avenue Budgewoi NSW 2262 (043) 90 7339
Western Sydney PC and Compatibles User Group	PC and compatibles	Meetings are held on the 3rd Sunday of each month at 27 Cosgrove Crescent, Kingswood NSW 2750	Ben Sharif (047) 36 4825

VICTORIA

Adam User Group	Coleco Vision Adam	Meetings are held as required at 10 Old Geelong Road, Point Lonsdale Vic 3225.	Dennis Riley President (052) 52 2237 or Frank Ellis Secretary (07) 345 7143
Apple User's Society of Melbourne (AUSOM) Inc.	Apple	Meetings are held on the 1st Saturday of each month at the Burwood Education Centre, Victoria College, Burwood Highway, Burwood.	AUSOM Inc PO Box 49 Burwood Vic 3125
BBC User Group	BBC	Meets on the last Wednesday of each month, 7-9.30pm at Copiquest, 423 Clarendon Street, South Melbourne.	Secretary Mr G E Howell (03) 420 2611 (BH) or President Mr T Robinson (03) 3B6 7529 (AH)
Color Computer Club	TRS-80 Color Computer	Meets on the 1st Friday of each month at Geelong College at 8pm.	David Collen Secretary 12 Hereford Drive Belmont Vic 3216 (052) 43 2128
Essendon Commodore 64 User Group	Commodore 64	—	George Strathoulis 8 Byron Avenue East Keilor Vic 3036 (03) 337 4159
Forth Interest Group	Forth	Meets on the 1st Friday of each month at 8pm. Contact Secretary for details.	Lance Collins PO Box 103 Camberwell Vic 3124 (03) 29 2600
Geelong Atari User Group	Atari	Meets on the 1st Tuesday of each month at the Newtown Club, Skene Street, Newtown, commencing at 7.45pm.	Brian Oates Secretary PO Box 673 Geelong Vic 3220
Geelong Commodore Computer Club	Commodore	—	Peter Hamilton Secretary C/- 39 Vermont Avenue Corio Vic 3214 (052) 75 4949 or (052) 26 3596

USER GROUPS INDEX

NAME OF GROUP:	CATERING FOR:	MEETINGS:	CONTACT:
KAOS	Ohio Scientific, Apple, Atari, IBM and others. Forth, CP/M, M/Code	The club meets at Essendon Primary School, Raleigh Street, on the last Sunday of each month at 1pm. And at the Hampton Scout Hall, corner of Kingston and Ludstone Street on the 1st Sunday of each month, at 2pm.	KAOS Secretary 17 Frudal Crescent Knoxfield Vic 3180 (03) 763 5983
MBUG Australia Inc.	MicroBee	Monthly meetings are held at 7.30pm on the 2nd Wednesday of each month at Mount Waverley Community Centre, Corner of Stephensons Road and Miller Streets, Mount Waverley.	Axel S Joscht Secretary MBUG Australia Inc. PO Box 157 Nunawading Vic 3131 RCP/M (03) 82 1571
Melbourne Atari Computer Enthusiasts (MACE)	Atari	Meetings are held at the Rotunda, Monash University on the 2nd Sunday of each month (excluding January), at 12pm.	MACE PO Box 340 Rosanna Vic 3084
Melbourne Color Computer Club	TRS-80 Color Computer	The club meets on the 1st and 3rd Tuesday of each month at the Uniting Church Hall, corner of Dandenong Road and Chapel Streets, St Kilda.	Mr Chris Hackett President 15 Redan Street East St Kilda Vic 3182 (03) 529 3735
Melb PC User Group Inc.	IBM and compatibles	Meets on the 2nd Wednesday of each month at 6pm at the Ground Floor Auditorium of Clunes Ross House at 191 Royal Parade, Parkville.	Secretary Melb PC User Group Inc. GPO Box 1728P Melbourne Vic 3001 (03) 481 1009
Lap Computer User Group	All lap computers	—	Secretary Lap Computer User Group Box 2884DD GPO Melbourne Vic 3001
NM Micro User Group	Interested staff members of National Mutual in the Melbourne Head Office using any computer.	Monthly	Mr R Prewett Convenor NM MUG Box 2830 AA GPO Melbourne Vic 3001
Otrona Attache User Group	Otrona Attache	—	David Broadbent Chairman C/- PO Box 21 Ashburton Vic 3147 (03) 528 2792
Peninsula Group	General	Meets at the Frankston Library on the 2nd Tuesday of each month at 7.30pm.	M G Thompson (03) 772 2674
Pocket Portable Programmers of Melbourne Inc.	Hand held computers or calculators	Meets on the 3rd Tuesday of each month on the 9th Floor of the Monash University Menzies building at 8pm.	Paul Cooper 40 Karen Street Box Hill North Vic 3129 (03) 898 7672 (AH)
Sorcerer & CP/M Users of Australia Inc. (SCUA)	Sorcerer, Excalibur, Bondwell and all machines which run the CP/M operating system.	Meetings are held on the 1st Sunday of each month (February to December), at 2pm. The location is Victoria College, Burwood Campus, 221 Burwood Highway, Burwood, Vic 3125.	Secretary SCUA GPO Box 2402 Melbourne Vic 3001
Southern Districts Commodore User Group	Commodore	Meets on the 1st and 3rd Wednesday of every month at the A.P.I. Hall, Kurrajong Road, Preston, at 6pm.	A Toms President 3 Lucille Crescent Casula NSW 2170 (02) 602 8691
Teach-80 Group	General	Meets on the 1st Wednesday each month at the Waverley Centre, Miller Street Mt Waverley.	G Behrendorff Secretary (03) 232 4569
Turbo Pascal User Group	Turbo Pascal	1st Wednesday of each month, 7pm, at the Institute Function Room, RMIT Union, Melbourne.	Ron Savage PO Box 81 East Caulfield Vic 3145
Victorian Osborne User Group Incorporated	All Osborne types and any similar machines CP/M or MS-DOS.	Odd numbered machines — 4th Wednesday, 6pm at RMIT, Comms & Electronic Engineering Department, Building 12, floor 9. Even numbered months — 4th Sunday, 2pm at the Ashburton Public Library, 152 High Street, Ashburton.	Geoff Cartwright PO Box 169 Camberwell Vic 3124 (03) 459 8934 (AH)
Western Suburbs MicroBee User Group	MicroBee	1st and 3rd Thursday of each month at the Multiple Sclerosis Centre, corner of Furlong and St Albans Road, St Albans.	Ian Walker (03) 741 3625 or Bradley Bouchaud (03) 336 1019

TASMANIA

Southern Tasmanian Amstrad Club	Amstrad	The group meets at 7.30pm on the 1st Wednesday of each month at Elizabeth Matriculation College (1st Floor).	Vern McKay 137 Roslyn Avenue Blackmans Bay Tas 7152 (002) 29 4528
SVI-MSX Australasian User Group	Spectravideo/MSX	—	SVI-MSX Australasian User Group PO Box 191 Launceston South Tasmania 724 (003) 44 2493
TI 99/4 User Group	TI 99/4 Users	Monthly meetings at the University of Tasmania, Room 373, on every 3rd Sunday.	Rex C Shephard 1 Benboyd Court Rokeby Tas 7019

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USER GROUPS INDEX

NAME OF GROUP:	CATERING FOR:	MEETINGS:	CONTACT:
Tandy Hobart User Group	Tandy	The group meets on the 3rd Thursday of each month at the Southern Regional Office of the Department of Sport and Recreation, Kirksway House, Kirksway Place, Hobart. Meetings commence at 8pm.	Tandy Hobart User Group GPO Box 127IN Hobart Tasmania 7001 (002) 72 1426 (AH)

A.C.T.

ACT Apple	Apple	Meets on the 2nd Thursday of each month.	Secretary PO Box 1231 Canberra City ACT 2601
ACT VIC-20 User Association	VIC-20	—	Chris Groenhout 25 Kerferd Street Watson ACT 2602 (062) 41 2316
Australian Adventure Club	Apple and compatibles, Commodore 64	—	Charles Newton JR 19 Cloncurry Street Kaleen ACT 2617 (Commodore 64 users only). Bernard A Wiemers 10 Tardent Street Downer ACT 2602 (All other computer users).
Australian ZX User Association (ASUA)	Sinclair Computers	Meets on the last Wednesday of each month at the Woden Valley High School Library, Ainsworth Street, Phillip.	David Vernon AZUA 50 Waller Crescent Campbell ACT 2601
Canberra Micro-80 User Group	TRS-80, System 80 and any other Z80-based microcomputers.	Meets on the 3rd Monday of each month in the large lecture theatre of Building J, Canberra Technical College, Constitution Avenue, Reid at 7.30pm.	Harry Cooper Secretary 113 Owen Dixon Drive Evatt ACT 2617 (062) 58 3700
Compucolor User Group	Compucolor	—	Ken Kerrison 5 Beltana Road Pialligo ACT 2609 (063) 47 6575

QUEENSLAND

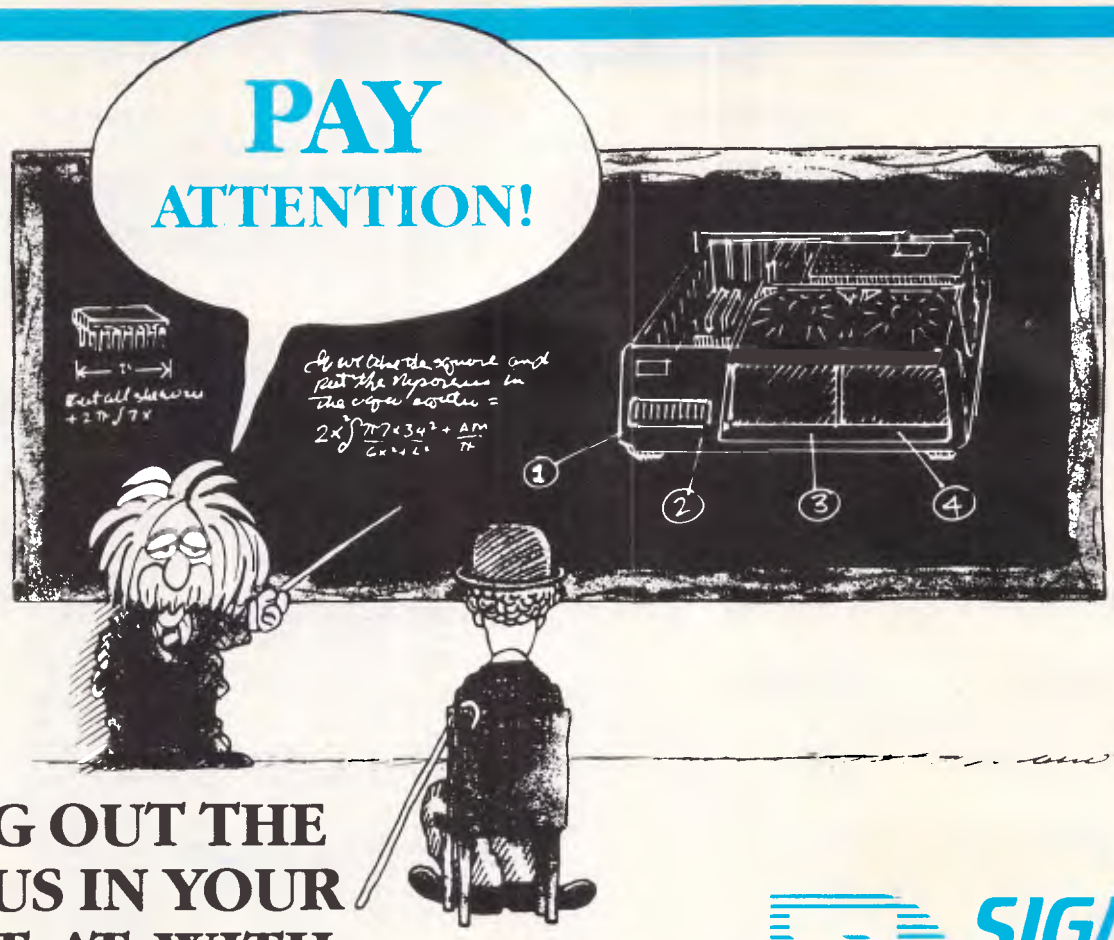
Adventure Club	Commodore 64/128	Postal only. Bi-monthly newsletter.	Adventure News Stuart Elflett M.S.F. 550 Toogoolawah Qld 4313 or Adventure News Jamie Osborne 123 Beatrice Street Doubleview WA 6018
Australian Postal Institute Computer User Group	—	Meetings are held on the 1st Monday of each month, 6.15pm at 14th floor, AAMI building, 97 Creek Street, Brisbane.	Steve Devine (07) 835 7044 or Keith Atkinson (07) 835 8033
Brisbane Spectravideo & MSX User Group	All MSX and Spectravideo	—	Lucille Parker Secretary 25 Primrose Street Woodridge Qld 4114
Brisbane 16-bit User Group (BRISBUG)	16-bit micros	Meets on the 3rd Sunday of each month, 2pm at the Toowong High School.	Roy Willie Jnr BRISBUG PO Box 305 Wynnum Central Qld 4178
Bundaberg Commodore Computer User Group	Commodore	The group meets on the 1st Sunday of each month from 10am to 4pm at the West State School Library, Steffensen Street, Bundaberg.	(071) 72 7098 or (071) 79 2426
Cairns Commodore User Group	Commodore	—	PG Aiken Secretary Cairns Commodore User Group PO Box 7 Earlville Cairns QLD 4870
Commodore Computer User Group (Qld) Inc.	Commodore	Meetings are held on the 1st Tuesday of each month (except January), at 7.30pm in the Playground and Recreation Association Hall at the corner of Love Street and Water Street in Spring Hill, Brisbane.	Norm Chambers PO Box 274 Springwood Qld 4127 (07) 341 5651
Commodore Computer Users Group (Townsville)	Commodore	Meetings are held at 7.30pm on the 1st Wednesday of every month (except January), at the computer room of Ignatius Park College, Ross River Road.	Bruce McGovern Secretary 43 Fitzroy Street Cranbrook Townsville Qld 4814 (077) 75 4349
Compucolor User Group	Compucolor	Meets on the 2nd Saturday of each month at 1pm	Ray Halliday 325 Enoggera Road Newmarket Qld 4051 (07) 356 4236

USER GROUPS INDEX

NAME OF GROUP:	CATERING FOR:	MEETINGS:	CONTACT:
Darling Downs Apple Users Group	Apple	Meets on the 3rd Tuesday of each month at the Toowoomba Education Centre, Baker Street, Toowoomba.	Darling Downs Apple User Group PO Box 53 Darling Heights Qld 4350 or contact the group Secretary Alan Chapman (076) 38 4853 (AH) (076) 32 3933 Extension 1 (BH)
Memotech Computer User Group	Memotech	—	Memotech Computer User Group PO Box 497 Maroochydore Qld 4558
NEC PC-8000 User Group	NEC-PC-8000	Meets on the 2nd Friday of each month at the Old Town Hall, South Brisbane.	NEC PC-8000 User Group C/- David M Clark 18 Provence Street MacGregor Qld 4109
Queensland Amstrad Users Cassette Journal	Amstrad	Circulation of a monthly cassette or disk.	Frank Ellett 59 Twentyseventh Avenue Palm Beach Qld 4221 (075) 35 5815
Queensland CP/M Users	Any CP/M computer	Meetings are held on the last Sunday of each month at the University of Queensland Civil Engineering Work Room 1.01 (off Staff House Road) from 1pm.	Secretary/Treasurer PO Box 1025 Milton Qld 4064 (07) 369 4288
Sega User Group	John Sands Sega	—	Keith Zuch (07) 288 3115 or Robert Horkings (07) 52 5603
Sharp User Group of Brisbane	Sharp	The club meets on the 2nd Wednesday of each month at the Graceville State School.	Bill Laidlaw 51 Sandon Street Graceville Qld 4075 (07) 379 3457
Southport Commodore Computer User Group	Commodore	Meets fortnightly at the Labrador State Primary School, Turpin Road, Labrador.	Mark Voevodin Secretary (075) 50 2299 or John Smith Co-Secretary (075) 58 2929
Townsville MicroBee User Group	MicroBee	Meets at 7.30pm on the 2nd and 4th Monday of each month at St Margaret Mary's School, Hermit Park, Townsville.	Mannie Van Rijswijk (077) 73 4236
TRS-80/System 80 Computer Group	TRS-80 (Models I, III, 4, 4P), and System 80	Meets on the 1st Sunday of each month (except January), at 2pm, at Lindum Hall, Lindum Road, Lindum (near Wynnum, Brisbane)	W J Allen Secretary 16 Laver Street Macgregor Qld 4109 (07) 343 5771
University of Queensland Kaypro User Group	Kaypro	Meets bi-monthly at the Botany Department.	David Yates 377 2070 (Botany Department)
University of Queensland Osborne User Group	Dsborne	Meets on the 2nd Tuesday (odd months), and 2nd Wednesday (even months), at the Axon Building (on campus), at 7pm.	Glen McBride C/- Womens College College Road St Lucia Qld 4067 (07) 870 1177
VZ South Pacific User Group	VZ-200/300	—	John D'Alton 39 Agnes Street Toowong Qld 4066 (07) 371 3707

SOUTH AUSTRALIA

Adelaide Atari Computer Club	Atari	The group meets at the Gillies Street Primary School, City, on the 1st Monday (2nd, if 1st is on a public holiday), and 3rd Monday of each month at 7.30pm.	Adelaide Atari Computer Club PO Box 333 Norwood SA 5067
Adelaide Sega User Group	John Sands Sega	—	Jan Jacobsen (08) 382 7967 or Jamie Anderson (08) 263 5020
Australasian Aquarius Users Club	Aquarius Computers	Bi-monthly newsletter	Australasian Aquarius Users Club 7 Duncraig Lane Stirling SA 5152
Beebnet	BBC and Econet	Meetings are held on the last Monday of each month.	Beebnet PO Box 262 Kingswood SA 5062
Darwin PC User Group	IBM and compatibles	The group meets on the 1st Sunday of each month at 5 Binet Court, Malak, at 8pm.	Terry O'Brien 5 Binet Court Malak SA 5793 (089) 27 4454
Hitachi User Group	Hitachi	—	Cliff Hignett 45a Ormond Avenue Daw Park SA 5041 (08) 276 7706



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NAME OF GROUP:	CATERING FOR:	MEETINGS:	CONTACT:
MicroBee User Group of South Australia Inc.	MicroBee	Meets on the 3rd Monday of each month (except Jenuary), at 18 Arthur Street, Unley, 7.30pm.	Secretary GPO Box 767 Adelaide SA 5001
South Australian Apple User Club Inc.	Apple II series and has a Mac user group.	The club meets on the 1st Fridey of each month at the Prospect Town Hall.	SA Apple User Club PO Box 322 Prospect SA 5082 Secretary (08) 293 7183
South Australian Commodore User Group	Commodore	Meets on the 1st Tuesday of each month at Gilles Street Primary School, Gilles Street, Adelaide, at 7.30pm.	SA Commodore Users Group PO Box 427 North Adelaide SA 5006

WESTERN AUSTRALIA

Australian QL User Association (AQUA)	Sinclair QL	Meets every other month.	Graeme Ashford Secretary 12 St Michael Terrace Mount Pleasant WA 6153
Australian Turbo User Group	All Pascal and Modula-2	The group meets monthly (Feb to Nov), every 2nd Tuesday at Room G-3, Electrical and Electronic Engineering Building, University of WA, (use Fairway entrance 3 or 4). The meeting commences at 7.30pm.	Australian Turbo User Group WA School of Computing and Computing Science 2/294 Rokeby Road Subiaco WA 6008 (09) 382 2692
Compucolor User Group	Compucolor	As announced in newsletter.	Doug Grant 2 Brookside Avenue South Peth WA (09) 367 4465
Excalibur 64 User Group	Excalibur	—	Jim Barbas (09) 342 3625 (AH) (09) 325 5809 (BH)
MicroBee User Group of Western Australia (MUGWA)	MicroBee	The meetings are held at 7pm on the 1st Sunday of each month at the Nurse's Lecture Theatre of the Sir Charles Gairdner Hospital, Shenton Park.	The Membership Officer GPO Box NI090 Perth WA 6001
Osborne User Group (OSWEST)	Osborne and other machines running CP/M.	Meetings are held on the 1st and 3rd Wednesay of each month at the Palmyra Recreation Centre (1st Wednesday), Subiaco Exhibition Hall (3rd Wednesday). Meetings are held at 7.30pm.	Robert Hunt Secretary OSWEST 4 Cato Street Glendalough WA 6016 (09) 444 0071
Sega User Group	John Sands Sega	—	John McLennan (09) 342 5905
WA Cromemco User Group	Cromemco and other S-100 and similar computers.	Meets monthly (Feb to Nov), every 3rd Tuesday at Suite 2, 294 Rokeby Road, Subiaco. Meetings commence at 7.30pm.	Secretary WA Cromemco User Group Suite 2/294 Rokeby Road Subiaco WA 6008 (09) 382 2692

NEW ZEALAND

EPSON Personal Users Group. CW Nighy. Telephone: 77 4268. Minerva NFC001. Meetings: 1st Tuesday of each month at 231 Khyber Pass Road, Auckland.

NZ Commodore User Group (AK): Kaye Coddigton. Telephone 58 B931, PO Box 5223, Auckland. Meetings: 3rd Wednesday of each month at the Remuera Primary School Hall, Dromorne Road, Remuera.

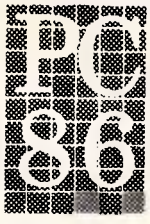
NZ Microcomputer Club Inc: Peter Taylor (Chairman). Telephone 57 6618, PO Box 6210, Auckland.

Tomorrow User Group: Chris Cotton. Telephone: 78 9153 or 39 6185. Meetings: 3rd Wednesday, ASMAIL, 205 Federal Street, Auckland City. ASMAIL system is also available to Australians. It can be contacted by Packet-Switch Networks such as AUSTPAC. Number is 0 5301 9700 0016. Enter at the prompt "asmail login:". The word 'asbox" to send a message to ASMAIL requesting membership information. The answer back code is AS0002 MAIL. Address is: PO Box 39-159, or telephone 39 6185 Auckland. Users may join by telephone if they have a credit card.

STOP PRESS

A comprehensive list of available for Tandy Color Computer users wanting to locate their nearest User Group. This list may be obtained by writing to Andrew White, 24 Barfoot Street, Bracken Ridge, Qld 4017. The list is much too long to be published in APC.

Assco stand's showing Millergonomics



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DIARY DATA

Readers are strongly advised to check details with exhibition organisers before making travel arrangements to avoid wasted journeys due to cancellations, printers' errors, etc.

Melbourne	PC86 — The Seventh Australian Personal Computer Show also incorporating Communication '86 and Office Technology '86. Contact: Ms F Michael, Australian Exhibition Services Pty Ltd Suite 3.3, 424 St Kilda Road Melbourne 3004. (03) 267 4500	June 1-4, 1986
Nice, France	Comdex International Contact: Interface Group Headquarters, World Trade Center, Strawinskylaan 1245, 1077 XX Amsterdam, The Netherlands. (31) 20 621941	June 10-12, 1986
Sydney	Videotex '86 Contact: Riddell Exhibition Promotions (03) 429 6088	July 1-3, 1986
Sydney	Ausgraph '86 Contact: Robyn Hughes (02) 266 9711	July 7-11, 1986
Sydney	New Product and Technology Expo Contact: Park Productions (02) 439 7738	July 17-21, 1986
Gold Coast Melbourne	ACC '86 Contact: Riddell Exhibition Promotions (03) 429 6088	September 16-20, 1986 September 23-26, 1986

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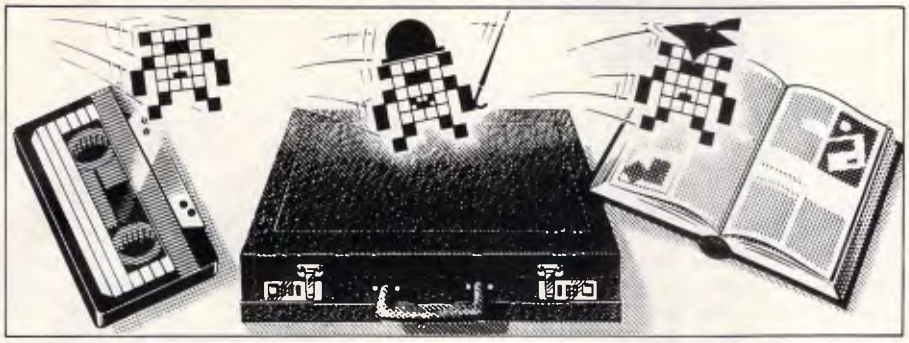

- ***Games***
- ***Scientific/mathematic***
- ***Business***
- ***Toolkit/utilities***
- ***Educational/Computer Aided Learning***

Owen Linderholm selects the best of readers' programs. For details on submitting your own, see the end of this section.

In Program File last month I mentioned the changes which are taking place in the column. So far, little indication of how readers feel about these changes has reached me, although some people have begun to send in programs containing improved documentation. Please let me know your opinions of the new-style Program File, especially those of you who contribute programs.

I must stress once again that I receive too many programs such as disassemblers, Hangman, versions of Othello, character set editors, and so on. The principles of these oft-published programs apply to almost all current machines, so do not need to be repeated. I would like to receive novel applications of the sort that *APC*, and everyone else, has not seen before, an example of which is the expert system published in the March issue. Although similar programs have appeared as commercial products, that was the first time, to my knowledge, that an expert system of some real utility has appeared as a listing.

Remember that an increasing number of machines is being catered for by Microtex 666, so that program listings which appear for these micros in *APC* are available for downloading from Microtex 666. And of course there is a range of other programs also available from the Microtex telesoftware library — so if you're hungry for listings, join Microtex 666.

The recent announcements for the Atari ST and the Commodore Amiga have pushed the old-favourite home machines back into the shadows. As always, the new fashions get all the coverage, but unlike the fashion world, computers go on being used; it is still possible for the old, work-weary Spectrum to produce something exciting.

Yes, you've guessed it — the Program of the Month is for the plain, vanilla-flavoured 48k Spectrum. It is called Animator, and produces smooth, high-resolution animation from up to 15 frames; animation is at a speed of up to 25 frames per second. Screens are created from within the program and can be played back at variable speeds. The demonstrations which accompanied the program were: a cut-away model of a four-stroke engine at work; the valve gear of a steam locomotive; and a spinning globe.

Computer animation is a subject which interests many people. The classic technique, lifted straight from the way in which films and cartoons work, is to display frames (or pictures) in rapid succession. If each frame is slightly different from the last, then this creates the illusion of motion. The problem with computers is the speed with which a full screen of high-resolution graphics can be displayed, and the huge amounts of memory required to hold the pictures. The solution is to compromise on resolution, colour, size or speed.

Animator uses the classic film-making technique, and achieves the remarkable speed of 25 frames per second by only animating one third of the Spectrum screen and only using two colours. This allows up to 15 frames of high-resolution graphics to be used, so it is possible to create some good animation.

The uses to which personal computers are put have changed from the early days of microcomputing. Originally, they were used by enthusiasts for programming and investigating internal secrets. (Incidentally, these enthusiasts were the hackers of that time. It is only relatively recently that 'hacker' has become a name for someone who uses telecommunications systems to break into other people's computer systems. Formerly a hacker was 'merely' a computer enthusiast.)

The most common function of computers is as word processing systems, and just as the IBM juggernaut is generating copies and clones, so WordStar, the word processing heavyweight, is generating copies. Many computer users use WordStar in one form or another, and M Rhodes has discovered an undocumented feature of WordStar. This tip allows global searches and replaces to proceed very quickly by switching off their appearance onscreen.

Program File often acquires an international flavour, as contributions come from around the world. Miguel Campos of Peru has submitted a subroutine of great value for Apple programmers. It simulates an Erase Array command, allowing the redimensioning of arrays from within a program.

Dr Vaclav Skala of Czechoslovakia has sent in a tip regarding the way in which variables are stored internally in the Amstrad CPC machines, and shows how to use this information to provide a cross-referencing utility.

Other programs this month include Commodore 64 Stock, a simple stock control and re-order database for small businesses or shops.

For Amstrad users, there's a utility which displays the Caps Lock and Shift Lock status at the bottom of the screen; separately is a utility for cross-referencing variables in program debugging; and there's another listing from Justin Moffitt, the author of the popular Amsquill program which featured in the December 1985 issue of *APC*. Lastly, there is a short 'pausing' utility for the VZ-200.

Amstrad LOKVIEW

by Paul Jenkins

This short machine code routine displays the Caps Lock and Shift Lock state at the bottom of the screen. It is interrupt-driven and so works continually once it has been set up.

To set up the machine code program, use the Basic loader which checks for typing errors in the machine code data. Once the data has been entered correctly and POKED into memory, save it with SAVE"lokview.bin",b,&xxxx,&F0 where &xxxx is the start address of the machine code. It is important to save the machine code before it is called. As the program is relocatable, it can be installed anywhere in memory and run from there. The Binary Loader program loads the program just above HIMEM, and can be merged into any program where the status is to be displayed.

The assembly listing shows how the program works. Firstly, screen windows are set up; then an interrupt routine is added to the Frame Flyback event. The routine then returns to Basic, but the interrupt routine will be activated every fiftieth of a second. After a Mode command, the windows will be changed; they can be reset by WINDOW 1,80,1,24:WINDOW #7,1,80,25,25, or you can CALL the address at which LOKVIEW is stored.

```
10 ' ************************
20 ' *       LOKVIEW        *
30 ' *    Paul S Jenkins    *
40 ' *        1986          *
50 ' ************************
60 '
70 ' Basic Loader
80 '
90 '
100 address=HIMEM-&F0
110 entry=address
120 MEMORY address-1
130 RESTORE 290
140 FOR lin=290 TO 580 STEP 10
150   sum=0
160   FOR column=0 TO 7
170     READ byte$
180     value=VAL("&"+byte$)
190     POKE address,value
200     sum=sum+value
210     address=address+1
220   NEXT column
230   READ checksum
240   IF checksum<>sum THEN PRINT"Checksum
      error at line";lin:STOP
250 NEXT lin
260 PRINT"'LOKVIEW' machine-code now loaded"
270 PRINT"at address &";HEX$(entry,4)
280 END
290 DATA  21,E1,E9,22,30,00,F7,EB,1055
300 DATA  21,21,00,19,4E,23,46,79,395
310 DATA  B0,28,2F,E5,60,69,19,E5,947
320 DATA  4E,23,46,60,69,19,44,4D,554
330 DATA  E1,71,23,70,E1,23,18,E4,997
340 DATA  61,00,67,00,6D,00,74,00,425
350 DATA  7E,00,8E,00,91,00,AE,00,587
360 DATA  B2,00,B8,00,BD,00,00,00,551
370 DATA  00,00,3E,07,CD,B4,BB,11,658
380 DATA  18,00,21,18,4F,CD,66,BB,654
390 DATA  CD,6C,BB,AF,CD,B4,BB,11,1264
400 DATA  00,00,21,17,4F,CD,66,BB,629
410 DATA  CD,6C,BB,00,11,40,18,21,638
420 DATA  F9,FF,72,23,73,21,5C,00,893
430 DATA  3E,C9,77,21,C9,00,06,81,751
440 DATA  0E,00,11,79,00,C3,D7,BC,750
450 DATA  F5,C5,D5,E5,11,D2,00,CD,1316
460 DATA  21,BB,EB,7A,BE,20,05,7B,927
470 DATA  23,BE,28,03,CD,9F,00,11,649
480 DATA  D2,00,CD,21,BB,EB,72,23,1019
490 DATA  73,E1,D1,C1,F1,C9,3E,07,1253
500 DATA  CD,B4,BB,CD,6C,BB,AF,CD,1452
510 DATA  21,BB,EB,BA,C4,B7,00,BB,1207
520 DATA  C4,BC,00,C3,B4,BB,21,D4,1191
530 DATA  00,18,03,21,DD,00,7E,FE,661
540 DATA  00,C8,CD,5A,BB,23,18,F6,987
550 DATA  00,00,00,00,00,00,00,00,0
560 DATA  00,00,00,18,20,43,41,50,268
570 DATA  53,20,18,00,18,20,53,48,350
580 DATA  49,46,54,20,18,00,00,00,283
590 ' lokldr
```

```
10 ' ************************
20 ' *       LOKVIEW        *
30 ' *    Paul S Jenkins    *
40 ' *        1986          *
50 ' ************************
60 '
70 ' Binary Loader
80 '
90 '
100 SYMBOL AFTER 256
110 address=HIMEM-&F0
120 MEMORY address-1
130 SYMBOL AFTER 240
140 LOAD"!lokview.bin",address
150 CALL address
160 PRINT"'LOKVIEW' is now loaded"
170 PRINT"at address &";HEX$(address,4)
180 PRINT"Press CAPS LOCK a few times"
190 PRINT"to see the routine working..."
200 PRINT:END
210 ' lokview
```

```
LOKVIEW Assembler Listing

.txt_win_enable.........&BB66
.txt_clear_window.......&BB6C
.kl_new_frame_fly.......&BCD7
.km_get_state...........&BB21
.txt_output.............&BB5A

.start
LD A,&07
CALL txt_stream_select
LD DE,&0018
LD HL,&4F18
CALL txt_win_enable
CALL txt_clear_window
XOR A
CALL txt_stream_select
LD DE,&0000
LD HL,&4F17
CALL txt_win_enable
CALL txt_clear_window

.ret_only
NOP
LD DE,&1840
LD HL,entry
LD (HL),D
INC HL
LD (HL),E
LD HL,ret_only
LD A,&C9
LD (HL),A
LD HL,block
LD B,&81
LD C,&00
LD DE,i_routine
JP kl_new_frame_fly

.i_routine
PUSH AF
PUSH BC
PUSH DE
PUSH HL
LD DE,flags
CALL km_get_state
EX DE,HL
LD A,D
CP (HL)
JR NZ,change
LD A,E
INC HL
CP (HL)
JR Z,set_flags


.change
CALL show

.set_flags
LD DE,flags
CALL km_get_state
EX DE,HL
LD (HL),D
INC HL
LD (HL),E
POP HL
POP DE
POP BC
POP AF
RET

.show
LD A,&07
CALL txt_stream_select
CALL txt_clear_window
XOR A
CALL km_get_state
EX DE,HL
CP D
CALL NZ,caps_on
CP E
CALL NZ,shift_on
JP txt_stream_select

.caps_on
LD HL,caps_string
JR print

.shift_on
LD HL,shift_string

.print
LD A,(HL)
CP &00
RET Z
CALL txt_output
INC HL
JR print

.block
DEFS &09

.flags
DEFS &02

.caps_string
DEFB &18
DEFS ' CAPS '
DEFB &18
DEFB &00

.shift_string
DEFB &18
DEFS ' SHIFT '
DEFB &18
DEFB &00

END
```

Program of the Month
Spectrum Animator
by I Bickerstaff

Spectrum Animator creates animated sequences on the 48k Spectrum. It uses one third of the screen and only two colours, so 15 frames can be stored in memory. When the program is run, the background and foreground colours are set up and a menu is displayed. This gives you options to load and save animation sequences; draw individual frames using a simple drawing program; run the animation at normal speed; run it in slow motion with variable speed; program an animation sequence; display an animation sequence; and change colours.

It is possible to program the animation sequence to display any sequence of up to 50 frames, in any order, made up from the 15 which the computer can store.

The program is very short and compact in order to leave room for the animation frames, so it isn't documented. It is, however, clearly written, and it should be fairly easy to decipher how it works. Some sample frames from the spinning globe animation are given with the program.

```
  1 CLEAR 33799: LET code=33800: POKE 23561,
10
  2 FOR n=0 TO 7 STEP 2: POKE USR "a"+n,136: POKE USR "a"+n+1,34: NEXT n
  3 DIM g(50): LET c1=33812: LET c2=33805: LET c3=33814
  4 LET q$="                "
  5 RESTORE 7: FOR n=code TO code+23: READ x: POKE n,x: NEXT n
  6 LET number=1
  7 DATA 33,0,72,17,48,98,1,0,8,237,176,201
  8 DATA 33,48,98,17,0,72,1,0,8,237,176,201
  9 DIM a(15): RESTORE 50
 10 LET s=132: FOR n=1 TO 15: LET s(n)=s+((n-1)*8): NEXT n
 100 INPUT "Paper Colour ? (0-7) ";paper: IF paper>7 OR paper<0 THEN  GO TO 100
 101 INPUT "Ink Colour ? (0-7) ";ink: IF ink>7 OR ink<0 THEN  GO TO 101
 102 INPUT "Border Colour ? (0-7) ";border: IF border>7 OR border<0 THEN  GO TO
102
 103 GO SUB 7500: CLS : GO TO 5000
 110 LET a$="n"
 115 INPUT "Clear animation ? (y/n) ";a$: IF a$="y" THEN  FOR n=1 TO 15: POKE c2
,a(n): RANDOMIZE USR code: NEXT n
 116 GO SUB 120: GO TO 150
 120 PAPER border: INK 9: PRINT AT 0,1;"q";AT 0,10;"return to menu"
 121 PRINT AT 1,0;"z x o l   <>^v -leave ink trail Z X O L   <>^v -rub-out trail
 : # ; =   <>^v -move pen"
 125 PRINT AT 4,0;"p";AT 4,10;"current and last frame";AT 5,0;"w e";AT 5,10;"slo
wer/faster pen";AT 6,0;"t";AT 6,10;"lable (SPACE to fix)"
 126 PRINT AT 18,0;"8";AT 18,10;"change pen";AT 19,0;"c r";AT 19,10;"compass/rui
er";AT 20,0;"ENTER";AT 20,10;"frame advance"
 130 RETURN
 150 FOR f=1 TO 15
 155 IF f>1 THEN  INPUT "Transfer the last frame to the  next 7 (y/n) ";a$: PRIN
T AT 21,0; PAPER border;q$
 160 LET frame=f
 175 IF a$="" THEN  PRINT AT 0,0;: GO TO 155
 190 IF a$<>"y" THEN  POKE c3,a(f): RANDOMIZE USR c1
 199 INK ink: LET step=1: LET x=127: LET y=79: GO SUB 7000
 200 LET ste=step: GO SUB 300
 210 IF INKEY$="z" AND x<256-step THEN  BEEP 0.005,1: PLOT x,y: LET x=x+step: GO
 TO 200
 211 IF INKEY$="x" AND x>-1+step THEN  BEEP 0.005,1: PLOT x,y: LET x=x-step: GO
 TO 200
 212 IF INKEY$="l" AND y>47+step THEN  BEEP 0.005,1: PLOT x,y: LET y=y-step: GO
 TO 200
 213 IF INKEY$="o" AND y<112-step THEN  BEEP 0.005,1: PLOT x,y: LET y=y+step: GO
 TO 200
 214 IF INKEY$="O" AND y<112-step THEN  BEEP 0.005,10: INVERSE 1: PLOT x,y: LET
 y=y+step: INVERSE 0: GO TO 200
 215 IF INKEY$="L" AND y>47+step THEN  BEEP 0.005,10: INVERSE 1: PLOT x,y: LET y
=y-step: INVERSE 0: GO TO 200
 216 IF INKEY$="Z" AND x>-1+step THEN  BEEP 0.005,10: INVERSE 1: PLOT x,y: LET x
=x-step: INVERSE 0: GO TO 200
 217 IF INKEY$="X" AND x<256-step THEN  BEEP 0.005,10: INVERSE 1: PLOT x,y: LET
 x=x+step: INVERSE 0: GO TO 200
 218 IF INKEY$=";" AND y<112-step THEN  BEEP 0.005,10: LET y=y+step: IF INKEY$="
;" THEN  GO SUB 300: LET step=step+1: GO TO 218
 219 IF INKEY$="-" AND y>47+step THEN  BEEP 0.005,10: LET y=y-step: IF INKEY$="-
" THEN  GO SUB 300: LET step=step+1: GO TO 219
 220 IF INKEY$=":" AND x>-1+step THEN  BEEP 0.005,10: LET x=x-step: IF INKEY$=":
" THEN  GO SUB 300: LET step=step+1: GO TO 220
 221 IF INKEY$="@" AND x<256-step THEN  BEEP 0.005,10: LET x=x+step: IF INKEY$="
@" THEN  GO SUB 300: LET step=step+1: GO TO 221
 222 LET step=ste
 223 IF INKEY$="e" AND step<8 THEN  BEEP 0.002,40: LET step=step+1: PRINT AT 17,
11; PAPER border; BRIGHT 0; INK 9;step: PAUSE 0: IF INKEY$<>"" THEN  GO TO 223
 224 IF INKEY$="p" THEN  BEEP 0.005,30: GO SUB 8000
 225 IF INKEY$=CHR$ 13 THEN  BEEP 0.05,20: POKE c2,a(f): RANDOMIZE USR code: NEX
T f: GO TO 5000
 226 IF INKEY$="q" THEN  POKE c2,a(f): RANDOMIZE USR code: GO TO 5000
 227 IF INKEY$="8" THEN  BEEP 0.05,30: GO TO 500
 228 IF INKEY$="c" THEN  GO SUB 400
 229 IF INKEY$="w" AND step>1 THEN  BEEP 0.002,40: LET step=step-1: PRINT AT 17,
11; PAPER border; BRIGHT 0; INK 9;step: PAUSE 0: IF INKEY$<>"" THEN  GO TO 229
 230 IF INKEY$="r" THEN  GO SUB 6500
 231 IF INKEY$="t" THEN  BEEP 0.05,30: GO TO 700
 290 GO SUB 7000
 295 GO TO 200
 300 OVER 1: PLOT x,y: IF x<250 THEN  DRAW 4,-4: PLOT x+1,y-2: DRAW 8,-1: PLOT x
+2,y-2: DRAW 1,0
 301 PAUSE 0
 302 PLOT x,y: IF x<250 THEN  DRAW 4,-4: PLOT x+1,y-2: DRAW 0,-1: PLOT x+2,y-2:
DRAW 1,0
 303 OVER 0: RETURN
 400 BEEP 0.005,30: INPUT "Position horizontally ? ";ph: IF ph<0 OR ph>255 THEN
 GO TO 400
 401 INPUT "Position vertically ? ";pv: IF pv<0 OR pv>255 THEN  GO TO 401
 402 INPUT "Radius ? ";r: IF pv+r>175 OR pv-r<0 OR ph+r>255 OR ph-r<0 THEN  GO T
O 400
 403 FOR n=0 TO 7: PAPER paper: PRINT AT n,0;q$: NEXT n: FOR n=16 TO 21: PRINT A
T n,0;q$: NEXT n: OVER 1: CIRCLE ph,pv,r
 410 INPUT "O.K. ? (y/n) ";z$: IF z$="y" THEN  BRIGHT 0: OVER 0: POKE c2,a(f): P
OKE c3,a(f): RANDOMIZE USR code: PAPER border: CLS : GO SUB 9000: RANDOMIZE USR
 c1: GO SUB 120: RETURN
 415 CIRCLE ph,pv,r
 420 GO TO 400
 500 LET x=15: LET y=12: BRIGHT 1: PAPER paper
 505 PRINT AT y,x; OVER 1; FLASH 1;"■": PAUSE 0: BEEP 0.005,1: PRINT AT y,x; OVE
R 1;"■"
 510 IF INKEY$="z" THEN  PRINT AT y,x; OVER 0;"■": IF x>0 THEN  LET x=x-1
 511 IF INKEY$="x" THEN  PRINT AT y,x; OVER 0;"■": IF x<31 THEN  LET x=x+1
 512 IF INKEY$="o" THEN  PRINT AT y,x; OVER 0;"■": IF y>8 THEN  LET y=y-1
 513 IF INKEY$="l" THEN  PRINT AT y,x; OVER 0;"■": IF y<15 THEN  LET y=y+1
 520 IF INKEY$=":" THEN  IF x>0 THEN  LET x=x-1
 521 IF INKEY$="@" THEN  IF x<31 THEN  LET x=x+1
 522 IF INKEY$="-" THEN  IF y>8 THEN  LET y=y-1
 523 IF INKEY$="=" THEN  IF y<15 THEN  LET y=y+1
 530 IF INKEY$="Z" THEN  PRINT AT y,x; oVER 0;" ": IF x>0 THEN  LET x=x-1
 531 IF INKEY$="X" THEN  PRINT AT y,x; oVER 0;" ": IF x<31 THEN  LET x=x+1
 532 IF INKEY$="O" THEN  PRINT AT y,x; OVER 0;" ": IF y>8 THEN  LET y=y-1
 533 IF INKEY$="L" THEN  PRINT AT y,x; OVER 0;" ": IF y<15 THEN  LET y=y+1
 540 IF INKEY$="p" THEN  BEEP 0.05,30: GO SUB 8000
 550 IF INKEY$="6" THEN  BEEP 0.05,30: GO TO 199
 600 GO TO 501
 700 POKE c3,a(f): POKE c2,a(f): INPUT "Lable:- ";z$: IF LEN z$>32 THEN  PAPER b
order: CLS : GO SUB 9000: GO SUB 120: RANDOMIZE USR c1: GO TO 700
 701 RANDOMIZE USR code: LET x=15: LET y=12: PRINT /0; FLASH 1;"z x o l mov=s la
ble"
 702 RANDOMIZE USR c1: BRIGHT 1: OVER 0: PRINT AT y,x: PAPER paper;z$: PRINT AT
16,0; INK 7; PAPER border;q$: PAUSE 0
 703 IF INKEY$="x" AND x>0 THEN  LET x=x-1
 704 IF INKEY$="z" AND x<31 THEN  LET x=x+1
 705 IF INKEY$="o" AND y>8 THEN  LET y=y-1

 706 IF INKEY$="l" AND y<15 THEN  LET y=y+1
 710 IF INKEY$="q" THEN  RANDOMIZE USR c1: BEEP 0.005,30: GO TO 700
 715 IF INKEY$=" " THEN  BEEP 0.05,30: INPUT "": GO TO 199
 720 GO TO 702
1000 GO SUB 9500
1040 LET spd=1
1050 PRINT AT 4,0; PAPER border; BRIGHT 0; INK 9;"q   -return to menu";AT 5,0;"w
-e -slower/faster";AT 17,0;"Frame Number= ";n;" ";AT 17,23;"Speed= ";50-spd;AT 1
,11;"SLOW MOTION"
1100 FOR n=ff TO 1f
1110 POKE c3,a(n): RANDOMIZE USR c1
1120 PRINT AT 17,14; PAPER border; INK 9;n;"  "
1130 FOR o=1 TO spd: IF INKEY$="q" THEN  GO TO 5000
1131 IF INKEY$="e" AND spd>1 THEN  LET spd=spd-1: PRINT AT 17,30; PAPER border;
INK 9;50-spd;" "
1132 IF INKEY$="w" AND spd<50 THEN  LET spd=spd+1: PRINT AT 17,30; PAPER border;
 INK 9;50-spd;" ": IF spd=50 THEN  PAUSE 0
1133 NEXT o
1134 IF spd=50 THEN  PAUSE 0
1135 NEXT n
1140 GO TO 1100
2000 GO SUB 9500
2001 PRINT AT 10,0; PAPER border; INK 9;"any key -return to menu";AT 21,16;"25 f
rames/second"
2005 FOR n=ff TO 1f
2010 POKE c3,a(n): RANDOMIZE USR c1: PAUSE 1
2020 NEXT n
2031 IF INKEY$="" THEN  GO TO 2005
2032 GO TO 5000
3000 PRINT AT 18,0; PAPER border; INK 9;"Program animation..."
3001 FOR n=1 TO 50
3002 INPUT "Frame number ? (0 to stop) ";fn: IF fn<0 OR fn>15 THEN  GO TO 3002
3003 LET number=n: IF fn=0 THEN  GO TO 5000
3004 LET g(n)=fn: PRINT AT 20,13; PAPER border; INK 9;n;":";g(n);" "
3010 POKE c3,a(fn): RANDOMIZE USR c1
3020 NEXT n
3030 GO TO 5000
4000 IF number<2 THEN  GO TO 5000
4001 FOR d=18 TO 21: PAPER border: INK 9: PRINT AT 21,16;"17 frames/second";AT 1
8,0;"any key -return to menu": NEXT d: FOR a=1 TO number-1
4005 POKE c3,a(g(a)): RANDOMIZE USR c1
4010 IF INKEY$="" THEN  NEXT a: GO TO 4000
4015 GO TO 5000
5000 BORDER 0: PAPER 0: INK 7: BEEP 0.05,40: CLS : PRINT AT 8,12;"M E N U"; OVER
 1;AT 8,12;"         "
5001 PRINT AT 3,5;"1) LOAD";AT 5,5;"2) SAVE";AT 7,5;"3) DRAW FRAMES";AT 9,6;"4)
RUN normal speed"
5002 PRINT AT 11,5;"5) RUN slow motion";AT 13,5;"6) PROGRAM ANIMATION"
5003 PRINT AT 15,5;"7) RUN ANIMATION";AT 17,5;"8) CHANGE COLOURS"
5010 INPUT "Number ? (1-8) ";a: IF a>8 OR a<1 THEN  GO TO 5010
5020 GO SUB 7500: BORDER border: PAPER border: INK 9: CLS : GO SUB 9000: PAPER p
aper: INK ink
5025 IF a=1 THEN  LOAD ""CODE 33840: GO TO 5000
5026 IF a=2 THEN  GO TO 6000
5027 IF a=3 THEN  GO TO 104
5028 IF a=4 THEN  GO TO 2000
5029 IF a=5 THEN  GO TO 1000
5030 IF a=6 THEN  GO TO 3000
5031 IF a=7 THEN  GO TO 4000
5032 IF a=8 THEN  GO TO 100

5100 GO TO 5000
5000 GO SUB 9500
6001 LET st=32048+(ff*2048): LET ft=(32048+((1f+1)*2048))-255: LET length=ft-st
6005 INPUT "Title ? ";t$: IF LEN t$>10 THEN  GO TO 6000
6010 SAVE t$CODE st-256,length+256
6020 GO TO 5000
6500 BEEP 0.005,10: LET x1=x: LET y1=y: PRINT /0; FLASH 1;"SPACE to fix"
6510 FOR n=1 TO 2: OVER 1: PLOT x,y: DRAW x1-x,y1-y: NEXT n: OVER 0
6520 IF INKEY$="x" AND x<255 THEN  LET x=x+1
6521 IF INKEY$="z" AND x>0 THEN  LET x=x-1
6522 IF INKEY$="l" AND y>40 THEN  LET y=y-1
6523 IF INKEY$="o" AND y<111 THEN  LET y=y+1
6525 IF INKEY$=" " THEN  PLOT x,y: DRAW x1-x,y1-y: BEEP 0.005,10: INPUT "": RETU
RN
6530 GO TO 6510
7000 PRINT AT 17,0; PAPER border; BRIGHT 0; INK 9;"Pen Speed= ";step;AT 17,18;"F
rame No.= ";frame: RETURN
7500 BRIGHT 0: OVER 0: INVERSE 0: FLASH 0: BORDER border: PAPER border: INK ink
7501 RETURN
7600 BRIGHT 1: OVER 0: INVERSE 0: FLASH 0: PAPER paper: INK ink: RETURN
8000 FOR n=1 TO 10: POKE c2,a(f): RANDOMIZE USR code
8001 PAUSE 1: IF f>1 THEN  POKE c3,a(f-1): RANDOMIZE USR c1
8002 PAUSE 1: IF f>1 THEN  POKE c3,a(f): RANDOMIZE USR c1
8003 NEXT n: RETURN
9000 FOR n=8 TO 15: PRINT AT n,0; PAPER paper; INK ink; BRIGHT 1;q$: NEXT n
9001 PRINT AT 7,0; INK 0; PAPER border;"                              "
9002 BRIGHT 1: PRINT AT 16,0;q$: BRIGHT 0: RETURN
9500 INPUT "First Frame ? (1-15) ";ff: INPUT "Last Frame ? (1-15) ";lf: IF ff>lf
 OR ff<1 OR lf>15 THEN  GO TO 9500
9510 RETURN
```

WordStar Fast Search/Replace

by M Rhodes

It is usually preferable to compose reports in single-spacing (to see as much as possible on the screen), and to convert the final draft to double-spacing immediately before printing. Normally, people change the line spacing using the ^P S option, and then reformat the text using ^B. In the case of long files this is time-consuming, and has the disadvantage of obliterating the beginnings and ends of paragraphs where these are indicated by a blank line.

The following method uses some little-known WordStar commands. It not only reformats long files in a matter of seconds, but also retains the paragraph breaks. The steps are as follows:

1) Copy the text file into a temporary file, called TEMPOUT.DOC. The original file should not be used as the procedure prevents any further reformatting.

2) Edit TEMPOUT.DOC using the D option.

3) Use ^Q A to execute a find-and-replace. At the FIND? prompt enter ^P^N; at the REPLACE WITH? prompt enter ^P^N^P^N; and at the OPTIONS? prompt enter NG.

4) Check that the procedure is working correctly, then press Escape. This undocumented command switches off the screen echo during a find-and-replace. The effect is to greatly speed up the procedure, so that what might otherwise take many minutes takes only a few seconds. This would greatly speed up any global search/replace.

5) Save the TEMPOUT.DOC using ^K D, then enter P to print it.

6) Delete the temporary file.

Erase Arrays for the Apple 11

by M Campos

MICROTEX 666

This program is available electronically through Microtex 666's software downloading service. It is accessed through Viatel page *66637#.

Microsoft Basic on CP/M systems provides a command Erase a1,a2,.. which clears the arrays a1,a2,... from memory, allowing them to be redeclared in a new DIM statement. The routine given here takes advantage of the pointers kept by Applesoft in zero page, and takes approximately two seconds to clear five arrays.

Applesoft keeps a pointer to the place where the array space starts (ARYTAB, kept in locations 107 and 108 of zero page) and another to the byte following the last array element (STREND in locations 109 and 110). Within the array space, starting in ARYTAB, each array is stored with a header containing the following information.

Bytes 1 & 2: characters 1 and 2 of the array name. If integer or string, add 128 to the value of the first charcter; if string, add 128 to the value of the second character.

Bytes 3 & 4: pointer to the position of the next array header, stored as the number of bytes that have to be added to the array address in order to get the next array.

In the following bytes, Applesoft stores the dimensions of the array, and the array contents or pointers, to the string space. The routine works by finding the requested array and locating the pointers to the start (AFIRST) and end (ALAST) of the space occupied by the array. It then shifts all the memory contents between ALAST+1 and STREND to start in the position AFIRST.

The routine is more efficient if asked to erase the last dimensioned array. The only entry parameter is the name of the array to be erased, stored in the string variable Z$.

Each time a new variable is created these pointers are updated, so after the location of the pointers has been obtained, no new variables should be created. The routine occupies about 300 bytes of memory, and so is only worth using when dealing with arrays of more than 500 bytes (100 real elements or 250 integer).

```
600   REM E R A S E
601   S = 0                          !Sets space for S
   :  M = 256                        !Commodity constant
   :  L = LEN (Z$)                   !Length of var name
   :  I = ASC(MID$(Z$,L,1))          !Suffix code
   :  X = ASC(MID$(Z$,1,1))          !First character
   :  Y = 0                          !Second character
   :  IF L > 1 THEN                  !Set second character
         Y = ASC(MID$(Z$,2,1))
   :     IF Y < 65 THEN Y=0
602   X = X * M * (I=37) / 2         !Reset by suffix
   :  Y = Y * M * (I=36 OR I=37) / 2
                                     !STREND and ARYTAB
   :  S = PEEK (109) + PEEK (110) * M
   :  I = PEEK (107) + PEEK (108) * M
                                     !While var not found..
603   IF PEEK(I) <> X OR PEEK(I+1) <> Y THEN
   :     I = I + PEEK(I+2) + PEEK(I+3)*M
   :     IF I < S GO TO 603          '..and still in spce.
                                     !Shift array space
604   L = PEEK (I+2) + PEEK (I+3) * M
   :  FOR X = I+L TO S
   :     POKE X-L,PEEK(X)
   :     NEXT
```

Line 604 continued...

```
   :  S = S - L          !Reset zero page
   :  Y = INT (S/M)
   :  X = S - Y * M
   :  POKE 109,X
   :  POKE 110,Y
   :  POKE S,0
   :  POKE S+1,0
   :  RETURN
```

Amstrad Interactive Cross-Referencing

by V Skala

Cross-referencing can be a powerful tool in program debugging. Cross-referencing listings usually provide a listing of the program, followed by a list of all the variables in the program and the lines on which they occur. This routine shows how to find a single variable and the lines on which it occurs, and is done by searching for the internal representation of the variable within the program. All Basic programs are tokenised, or converted into internal formats, called tokens.

On the Amstrad, Basic variables are coded, so that internally they are represented by the ASCII codes preceded by a prefix. This is 040000 for reals, 020000 for strings, and 01000 for integers. The code 0080 (in hex) is added to the code for the last character of the name. The structure of each line internally consists of line length (two bytes), line number (two bytes) and the coded text. A subroutine to find a single variable is given. The strange star character should be typed in as the $ symbol for strings (I assume that the character used is the Czechoslovakian equivalent).

This routine could be used as the basis for a complete cross-referencing program.

```
1 rj1=0:CLS
2 GOTO 500
10 DIM a*(10)
20 a*(0)=STRING*(200,"*")
30 POKE @a*(0),PEEK(&170)
40 POKE @a*(0)+1,&72
50 POKE @a*(0)+2,&1
60 FOR j=1 TO LEN(a*(0))
70 PRINT HEX*(ASC(MID*(a*(0),j)),2);" ";
80 NEXT
90 PRINT
100 FOR j=&172 TO &180
110 PRINT HEX*(PEEK(j),2);" ";
120 NEXT
130 END
500 DEFINT a-z
510 INPUT "Give variable name",a*
520 GOSUB 1000
530 REM q* contains an inner code FOR the name
540 addr=&170:REM starting address
550 length=0
560 line1=0
570 b*="*"
580 WHILE PEEK(addr)+256*PEEK(addr+1)<>0
590 POKE @length,PEEK(addr)
600 REM length:=(addr) (length<=255)
610 POKE @b*,PEEK(addr)
620 POKE @b*+1,PEEK(@addr)
630 POKE @b*+2,PEEK(@addr+1)
640 POKE @line1,PEEK(addr+2)
650 POKE @line1+1,PEEK(addr+3)
660 IF INSTR(3,b*,q*)<>0 THEN PRINT USING
    "#####";line1;
670 addr=UNT(addr+length)
680 WEND
690 END
1000 REM give an inner representation
     for the a*
1010 q*=CHR*(0)+LEFT*(a*,LEN(a*)-1)
1020 q*=q*+CHR*(&80 OR ASC(RIGHT*(a*,1)))
1030 RETURN
```

BBC List Formatter

by B Carroll

MICROTEX 666

This program is available electronically through Microtex 666's software downloading service. It is accessed through Viatel page *66637#.

This program is well commented and fairly self-explanatory, and was originally intended to make the printer skip the perforations at the edge of listing paper. If the printer itself is set to do it, word processor output can often be spoiled.

The code produced should be *RUN from disk.

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```
*L.
  100 REM      FILENAME: S.PRLIST.       For BBC Micro with BASIC I or II.
  105 :
  110 REM                    (c) 1985, B.Carroll.
  115 .
  120 REM Filters ASCII codes > &80 from printer stream to stop control char-
  125 REM acters being sent to printer if listings use Teletext colour codes.
  130 REM Lines are counted so that a gap is printed every 56 lines to avoid
  135 REM the perforations. Characters are also counted & line count is incre-
  140 REM mented for every 80 characters sent since the last new line.
  145 REM This keeps track of program lines which are longer than printer line.
  150 .
  155 MODE7:@%=0
  160 .
  165 t$="Listing Formatter for Canon PW-1080A"
  170 PRINTTAB(8,1)CHR$130CHR$141t$
  175 PRINTTAB(8,2)CHR$133CHR$141t$
  180 :
  185 PRINTTAB(0,4)CHR$134"This utility filters characters with"
  190 PRINTCHR$134"codes > &80 from the printer stream."
  195 PRINTCHR$134"It also prints a gap of 10 lines after"
  200 PRINTCHR$134"every 56 printer lines to avoid the"
  205 PRINTCHR$134"perforations of standard fanfold paper."
  210 :
  215 PRINTTAB(0,11)CHR$132"(Just press RETURN for &900)"
  220 PRINTTAB(0,10)CHR$131"ENTER ADDRESS FOR CODE (Hex)"CHR$135"&":
  225 INPUT""5$
  230 IF 5$="" 5$="900":PRINTTAB(31,10)"900"
  235 5%=EVAL("&"+5$)
  240 .
  245 FOR pass=0 TO 2 STEP 2
  250   P%=5%
  255   [OPTpass
  260   \
  265   \       Set Fn Key 0 to list program  (used only with *RUN PRLIST)
  270   \
  275   .start      LDX #(key MOD 256)
  280               LDY #(key DIV 256)
  285               JSR &FFF7           \Use OSCLI to set Fn Key 0
  290   \
  295   \           Clear screen and write message
  300   \
  305               LDA #12
  310               JSR &FFEE           \Use OSWRCH for CLS
  315               LDX #0              \Set counter for text
  320   .read       LDA text,X          \Read text.....
  325               JSR &FFE3           \   .& output using OSASCI.
  330               INX
  335               CMP #13             \   .until end of string
  340               BNE read
  345               RTS                 \Wait for Fn Key 0 to be pressed
  350   \
  355   \           Point the WRCHvector to new code
  360   \
  365   .set        LDA &20E
  370               STA old_wrchv       \Save old vector lo byte.
  375               LDA &20F
  380               STA old_wrchv+1     \& the hi byte.
  385               LDA #(new_wrchv MOD 256)
  390               STA &20E            \Enter new vector lo byte.
  395               LDA #(new_wrchv DIV 256)
  400               STA &20F            \& tha hi byte.
  405               LDA #0
  410               STA countline       \Set line count to zero
  415               STA countchar       \Set char count to zero
  420               RTS                 \Wait for printer stream
  425   \
  430   \           Reset the WRCHvector to normal
  435   \
  440   .unset      LDA old_wrchv
  445               STA &20E            \Restore old vector lo byte.
  450               LDA old_wrchv+1
  455               STA &20F            \& the hi byte.
  460               RTS                 \Back to normal
  465   \
  470   \           Intercept output & count <CR>s
  475   \
  480   .new_wrchv  STA temp            \Save output character
  485               CMP #13
  490               BNE test            \If not CR test for Teext code
  495               LDA #0
  500               STA countchar       \Reset character count
  505               INC countline       \Increase line count
  510               LDA #56             \56 print lines/pege
  515               CMP countline
  520               BNE recover         \To output routine if <56
  525               LDA #0
  530               STA countline       \   .else reset line count.
  535               LDA #12
  540               JSR output          \   .& send form feed.
  545   \
  550   \           Test character & replace Telatext codes by space
  555   \
  560   .test       AND #&80            \Clear bits 0 to 6
  565               CMP #0              \Check whether bit 7 is clear
  570               BEQ chars           \If it is, ASCII code < &80
  575               LDA #32
  580               STA temp            \If not, replace by a space.
  585   \
  590   \           Count characters sent to output
  595   \
  600   .chars      INC countchar
  605               LDA #81             \Printer line is 80 characters
  610               CMP countchar
  615               BNE recover         \If less than 81 go to output.
  620               INC countline       \   .else add to line count.
  625               LDA #0
  630               STA countchar       \   .and zero character count.
  635   \
  640   .recover    LDA temp            \Recover stored character....
  645   .output     JMP (old_wrchv)     \   .& send to normal output routine.
  650   ]
  655   .
  660   REM Temporary stores & strings
  665   .
  670   old_wrchv=P%:temp=P%+2
  675   countline=P%+3:countchar=P%+5
  680   P%=P%+7
  685   .
  690   [OPTpass:.key:]
  695   $P%="K.0 :LL.D7|MCA. "+STR$set+"|M|BL.|M|CCA. "+STR$unset+"|ML.D0|M"
  700   P%=P%+50
  705   .
  710   [OPTpass:.text:]
  715   $P%=CHR$130+"Check printer, key F0 to print listing"
  720   P%=P%+40
  725   .
  730   NEXT pass
  735 .
  740 PRINTTAB(2,13)CHR$130"Copy....."
  745 PRINTCHR$134"*SAVE PRLIST "~5%" "~P%" "~5%
  750 PRINTTAB(2,18)CHR$130"Alternatively....."
  755 PRINTTAB(0,20)CHR$134"CALL &"~start" to activate the complete"
  760 PRINTTAB(10)CHR$134"autolisting routine."'
  765 PRINTCHR$134"CALL &"~set" to set the print routine."
  770 PRINTCHR$134"CALL &"~unset" or BREAK to disable it."TAB(1,15)
  775 :
  780 @%=10:END
```

Amstrad Toolkit

by J Moffitt

This Basic Toolkit loader program contains many data statements which are followed by a checksum. At the end of the listing, there is a general checksum which checks all the others. If a mistake is found in the program, it will stop with ERROR IN DATA AT LINE xxx; you must then edit that line and change the mistake. When is it POKEd into the RAM, the program may be saved and erased.

To start the toolkit type CALL 40000, which produces the usual message with some special additions. This message can be deleted with a higher call to the RAM (CALL 40003). The program can be saved by typing SPEED WRITE 1:SAVE "BASIC TOOLKIT" [ENTER]. To reload, type SYMBOL AFTER 32:RUN " (only characters after 32 may be redefined). The program can save at 4000 baud if TURBO is added to the previous command.

To check each block of the program, type CAT and rewind the tape to the correct place, then press PLAY.

The Amstrad CPC464 has a feature to add extra commands called RSXs (reserved system extensions). They are prefixed with a |,[SHIFT]&@.

The ROM must know the location of the command table, and must have a four-byte buffer. The command table contains the addresses of the commands, the name table contains the names. Fig 1 is a rough example in assembly language.

Where an @ appears this must be added, or the system may crash. |DPRINT must have a $; |DPRINT,"HELLO" will not do. The commands using variables not prefixed with @ can be entered with the value rather than the variables; |SCROLL,2 will do. If there are mistakes after the first run-through, the code should be reloaded. Any incorrect spellings will upset the machine and Basic can not be recalled. If a REM statement contains an RSX |, you must use || as a single | is deleted.

The following information is important:

×%=PEEK (45512).....This will set ×% to the present mode number.

×%=PEEK (46311).....This will set ×% to the value of shift lock, 255 on.

×%=PEEK (46312).....This will set ×% to the value of caps lock, 255 on.

×%=PEEK (45711).....This sets ×% to the present |TPATTERN value.

×%=PEEK (45712).....This sets ×% to the present |BPATTERN value.

```
Amstrad Assembler (v1)   Code assembled @40000 (Any origin will do!)

                LD HL,buffer    Declare buffer address
                LD BC,comtab    Declare command table address
                CALL &BCD1      Call routine to set up the RSX commands in ROM.
                RET             Return to Basic.
buffer          DEFS 4          Define 4 spaces of machine buffer.
comtab          DEFW nmetab     Tell the machine where the names are.
                JP command1     Jump to the first command.
                JP command2     Jump to the second command.
                JP ...          Set all the command values.
nmetab          DEF$ 'ANAM'     Declare the command name,except the last character,
                                upper case letters only!
                DEFB 'E'+&80    Add 80(HEX) to the last character in the command.
                DEF$ 'BNAM'     Define the second name.
                DEFB 'T'+&80    Add 80(HEX) to the last character.
                DEF$ ...        Define all the command names.
                DEFB 00         Tell the computer where to end.
command1        .............   Normal machine code routine start here.
                RET
command2        .............   Second command.
                RET
                .............   Define all the other commands...
```

Fig 1 An assembler version of the command table

```
|CAPSON.............Turn capitals lock on.
|CAPSOFF............Turn capitals lock off.
|SHIFTON............Turn shift lock on.
|SHIFTOFF...........Turn shift lock off.
|MOTORON............Turn cassette motor on.
|MOTOROFF...........Turn cassette motor off.
|DPRINT,@#:,.......Double height printing.
                    Eg.
                    A$="HELLO THIS IS DOUBLE":|CLS:|DPRINT,@A$:|DPRINT,@A$:|DPRINT,@A$:|D
|RESET.............Reset to the default colours/mode.
|COLOUR,#%.........Changes graphics colour.
|TAGCHR,#%.........Places a character at the graphics cursor.
|PUTCHR,#%.........Places any character on the screen, including control codes!
                    Eg.
                    FOR f=1 to 255:|PUTCHR,f:NEXT
|%=@:|COPYCHR,@#%...Takes character at the cursor and places it in %, if two
                    characters are the same the first is read.
|TURBO.............Changes save speed to around 4000 baud.
|FAST..............Changes save speed to around 2000 baud.
|SLOW..............Changes save speed to around 1000 baud.
|HOME..............Moves the cursor to the "home" position.
|ESCOFF............Completely disables the ESC key.|INKEY returns &52 for ESC.
|%=@:|INKEY,@#%.....Waits for the next key press and puts the character in #%.
|INVERSE...........Swaps pen and paper ink#.
|BELL..............Sound a "bell".
|CURSORON..........Turns on the cursor for INPUTs.
|CUSROROFF.........Turns off the cursor for INPUTs.
|SCREENON..........Turns the screen on.
|SCREENOFF.........Turns the screen off, useful for security checks or prompt
                    so that the code is not seen.
|TPATTERN,#%.......Changes the text colour to a set pattern, @ to 255.
|BPATTERN,#%.......Changes the background colour to a set pattern, @ to 255.
|FRAME.............Waits for the next frame fly-back, makes sprite movement
                    better.
|KEYBOARD..........Resets the keyboard, to the default, all function keys
                    reset.
|CLEARINPUT........Clears the keyboard buffer.
|OVERON............Turns on "over", all characters are placed on top of each
                    other.
|OVEROFF...........Turns off "over".
|SCROLL............Scrolls the screen 25 lines up.
|SCROLL,#%.........Scrolls the screen #% lines up.
|SCROLL,#%,b%,c%,d%,e%,f%,g%...
                    Scrolls a screen window with a%,b%,c%,d% being the normal
                    columns and rows as WINDOW, e% for up/down (@=up, 1=down).
                    f% for number of scrolls and g% for the pattern to fill
                    the vacant lines to, @ to 255 as |BPATTERN.
```

The command list

```
100 REM
110 REM RSX EXTENDED BASIC LOADER
120 REM
130 REM  (C)1985 Justin Moffitt
140 REM
150 MODE 2:count=0:MEMORY 39999
160 FOR value=40000 TO 40089 STEP 22
170  sum=0
180  FOR place=0 TO 21
190   READ number$
200   POKE value+place,VAL("&"+number$)
210   sum=sum+VAL("&"+number$)
220  NEXT
230  READ 1$:main=main+VAL(1$)
240  IF VAL(1$)<>sum THEN 740
250  count=count+10
260 NEXT
270 IF main(>109426 THEN PRINT "ERRDR IN MAIN SUM" ELSE CALL 40000:'NEW
280 DATA CD,43,9E,01,51,9C,21,4D,9C,CD,D1,BC,C9,22,FF,03,2B,B3,9C,C3,4D,9E,2834
290 DATA C3,53,9E,C3,71,9E,C3,AB,9F,C3,A9,9E,C3,80,9E,C3,D0,9E,C3,A2,9E,C3,3746
300 DATA C5,9E,C3,8B,9E,C3,F8,9E,C3,59,9E,C3,5F,9E,C3,BE,9F,C3,BB,9E,C3,9A,3771
310 DATA 9E,C3,9A,9E,C3,B3,9E,C3,87,9E,C3,ED,9E,C3,E2,9E,C3,9E,9E,C3,65,9E,3767
320 DATA C3,6B,9E,C3,77,9E,C3,70,9E,C3,D4,9E,C3,DB,9E,C3,92,9E,C3,02,9F,C3,3597
330 DATA 0B,9F,C3,14,9F,43,41,50,53,4F,CE,43,4F,50,53,4F,46,C6,42,45,4C,CC,2181
340 DATA 44,50,52,49,4E,D4,43,4F,4C,4F,55,D2,49,4E,48,45,D9,49,4E,56,45,52,2089
350 DATA 53,C5,54,41,47,43,48,D2,43,4F,50,59,43,48,D2,50,55,54,43,48,D2,43,2178
360 DATA 4C,45,41,52,49,4E,50,55,D4,53,48,49,46,54,4F,CE,53,48,49,46,54,4F,1948
370 DATA 46,C6,53,43,52,4F,4C,CC,52,45,53,45,D4,4B,4F,4D,C5,46,52,41,4D,C5,2290
380 DATA 4D,4F,54,4F,52,4F,CE,4D,4F,54,4F,52,4F,46,C6,4F,56,45,52,4F,CE,4F,2114
390 DATA 56,45,52,4F,46,C6,45,53,43,4F,46,C6,43,55,52,53,4F,52,4F,CE,43,55,2065
400 DATA 52,53,4F,52,4F,46,C6,53,43,52,45,45,4E,4F,CE,53,43,52,45,45,4E,4F,1933
410 DATA 46,C6,54,50,41,54,54,45,52,CE,42,50,41,54,54,45,52,CE,4B,45,59,42,2057
420 DATA 4F,41,52,C4,54,55,52,42,CF,46,41,53,D4,53,4C,4F,D7,00,7E,B7,C8,CD,2543
430 DATA 5A,BB,23,18,F7,0A,20,41,6D,73,74,72,61,64,20,36,34,4B,20,4D,49,63,1867
440 DATA 72,6F,63,6F,6D,70,75,74,65,72,20,20,28,76,31,29,0A,0A,0D,20,A4,31,1694
450 DATA 39,38,34,20,41,6D,73,74,72,61,64,20,43,6F,6E,73,75,6D,65,72,20,45,1890
460 DATA 6C,65,63,74,72,6F,6E,69,63,73,20,70,6C,63,20,20,20,20,20,20,20,20,1685
470 DATA 20,20,20,20,20,20,20,20,4C,6F,63,6F,6D,6F,74,69,76,65,20,53,6F,66,1641
480 DATA 74,77,61,72,65,20,4C,74,64,2E,20,20,20,20,20,20,20,20,20,20,20,1301
490 DATA 20,20,20,20,20,20,20,20,20,61,6E,64,20,4A,75,73,74,69,6E,20,4D,6F,1484
500 DATA 66,66,69,74,74,2E,0A,0A,0D,20,45,58,54,45,4E,44,45,44,20,42,41,53,1491
510 DATA 49,43,20,31,2E,30,20,0A,00,CD,BB,9E,21,BF,9D,CD,06,9D,C9,3E,FF,32,2304
520 DATA E8,B4,C9,3E,00,32,E8,B4,C9,3E,FF,32,E7,B4,C9,3E,00,32,E7,B4,C9,3E,3103
530 DATA 03,CD,5A,BB,C9,3E,02,CD,5A,BB,C9,3E,07,CD,5A,BB,C9,3E,06,CD,5A,BB,2735
540 DATA C9,3E,15,CD,5A,BB,C9,CD,6E,BC,C9,CD,71,BC,C9,DD,7E,00,CD,5D,BB,C9,3411
550 DATA CD,03,BB,C9,CD,19,BD,C9,CD,70,BB,C9,CD,48,BB,C9,DD,7E,00,CD,FC,BB,3577
560 DATA C9,DD,7E,00,CD,DE,BB,C9,CD,18,BB,DD,6E,00,DD,66,01,77,C9,CD,FF,BB,3401
570 DATA CD,BA,BB,CD,4E,BB,C9,CD,60,BB,DD,6E,00,DD,66,01,77,C9,CD,9C,BB,C9,3461
580 DATA DD,7E,00,32,BF,B2,C9,DD,7E,00,32,90,B2,C9,3E,16,CD,5A,BB,3E,00,CD,2672
590 DATA 5A,BB,C9,3E,16,CD,5A,BB,3E,01,CD,5A,BB,C9,CD,06,89,CD,ED,1C,CD,09,2870
600 DATA 89,C9,21,5F,00,3E,05,CD,6B,BC,C9,21,A7,00,3E,32,CD,6B,BC,C9,21,4D,2399
610 DATA 01,3E,19,CD,6B,BC,C9,CD,83,89,CD,06,89,3A,3C,9F,CD,45,BB,3B,85,CD,2675
620 DATA 86,89,1B,03,CD,89,89,11,3D,9F,01,00,00,ED,B0,C9,00,00,00,00,00,00,1477
630 DATA 00,00,80,00,00,00,00,00,00,80,00,00,00,00,00,00,00,00,00,00,01,1B,00,0817
640 DATA 21,3D,9F,11,45,9F,ED,A0,2B,ED,A0,7B,B1,20,F7,C9,3E,FE,21,45,9F,CD,2894
650 DATA AB,BB,3E,FF,21,4D,9F,CD,AB,BB,C9,CD,78,BB,E5,3E,FE,CD,5D,B8,E1,E5,3698
660 DATA 2C,CD,75,BB,3E,FF,CD,5D,BB,E1,24,CD,75,BB,C9,7B,32,3C,9F,CD,1D,9F,3111
670 DATA CD,55,9F,CD,68,9F,CD,79,9F,C9,00,00,00,00,00,1A,F5,13,1A,4F,13,1A,47,2114
680 DATA C5,0A,5F,CD,93,9F,C1,F1,83,3D,CB,F5,18,F2,FE,00,28,2D,FE,01,28,2D,2701
690 DATA FE,07,C0,DD,7E,00,DD,4E,02,DD,46,04,DD,5E,06,DD,6E,08,DD,56,0A,DD,2594
700 DATA 66,0C,18,24,F5,E5,C5,D5,CD,50,BC,D1,C1,E1,F1,00,CB,18,F1,0E,19,10,2940
710 DATA 03,DD,4E,00,C5,CD,17,BC,58,C1,3E,00,06,01,1E,18,6F,67,F5,79,FE,00,2145
720 DATA 28,03,F1,18,D3,F1,C9,00,00,00,00,00,00,00,00,00,00,08,00,00,B0,00,00,0961
730 END
740 PRINT "ERRDR IN LINE":count+280
```

VZ Pause

VZ Pause is a short routine for the VZ-200 which enables the computer to be 'paused' at any time. A pause can be initiated by pressing Shift-X. A short beeb will be produced to confirm that a pause has begun and pause can be terminated by pressing Shift-C, and again a short beeb will confirm this. The routine uses interrupts, and so will work with any software that does not disturb these interrupts. To use, type in the routine, and then CSAVE it immediately, as the program self-destructs when run. When the program is run, the pause facility becomes operational.

The program works in the following fashion:

- Lines 10-20 lower the RAMTOP to create space for a short machine language program
- Lines 30-40 set the address for the interrupt exit
- Lines 50-80 POKE the machine language program into the memory
- Line 90 makes the interrupt operational
- Line 100 clears the Basic routine from memory. This is necessary to prevent the system crashing should the routine be RUN twice.

```
10 TM=PEEK(30898)*256+PEEK(30897)-35
20 POKE30897,TM-INT(TM/256)*256:POKE30698,INT(TM/256)
30 TM=TM+1
40 POKE30846,TM-INT(TM/256)*256:POKE30847,INT(TM/256)
50 TM=TM-65536
60 FORA=0TO31
70 READB:POKETM+A,B
80 NEXT
90 POKE30845,205
100 NEW
110 DATA33,150,0,1,70,0,58,251,104,254,121,192,205,92,52,58,251
120 DATA104,254,115,32,249,33,200,0,1,60,0,205,92,52,201
```

Commodore 64 Stock

by PA & DC Stanford

MICROTEX 666

This program is available electronically through Microtex 666's software downloading service. It is accessed through Viatel page *66637#.

This program provides a simple stock control program for small shops or businesses and individual use. The operation of the program is fairly self-explanatory and all data entry is fully error-trapped. The program deals with stock and re-order levels, cost and selling price, stock value, re-order value, and can provide printouts either alphabetically or by part number.

All control codes in the listing have accompanying REM statements to explain their purpose. The program is written to run with a Commodore MPS 801 printer, but could easily be adapted, not only for other printers, but also for other computers. The program is intended for use with a disk drive, but could be modified to work with a cassette by changing all references to 'disk' to read 'cassette', and by substituting the following lines:

10080 OPEN 1,1,0,FI$
12090 OPEN 1,1,1,FI$

```
READY.


 1 REM********STOCK*********
 2 REM
 3 REM
 4 REM*********COPYRIGHT*********
 5 REM
 6 REM****PALDC STOCKBOARD 1985******
 7 REM
 8 REM
 9 REM-----------------------
 10 CLR:DIMFN(255),PN$(255),DE$(255),SL(255),RE(255):FA(11  FA(255)
 11 DIMZA(255):ZK(255)
 50 REM*****MAIN PROGRAM*************
 60 POKE53280,15:POKE53281,15
 65 REM CLR-ORN
 70 PRINT"[CLS][ORN                                    NEW/ ENTRIES"
 79 REM RED-  2*CRD BLU
 80 PRINT"[RD][CD][CD]     1  [BL]SET UP NEW FILE
 81 REM RED-CRD BLU
 82 PRINT"[RD][CD]     2  [BL]LOAD FILE FROM DISK"
 83 REM RED-CRD BLU
 84 PRINT"[RD][CD]     3  [BL]SAVE FILE TO DISK"
 85 REM RED-CRD BLU
 86 PRINT"[RD][CD]     4  [BL]EDIT FILE
 87 REM RED-CRD BLU
 88 PRINT"[RD][CD]     5  [BL]ADD NEW STOCK"
 89 REM RED-CRD BLU
 90 PRINT"[RD][CD]     6  [BL]REPLENISH/DELETE STOCK
 91 REM RED-CRD BLU
 92 PRINT"[RD][CD]     7  [BL]PRINT-OUT
 93 PRINT"[RD][CD]     8  [BL]CLEAR FILE/EXIT"
 96 REM BLK-  4*CRD BLU
 97 PRINT"[BK][CD][CD][CD][CD][CD]ENTER CHOICE..[BL]"
 100 GET A$:IFA$=""THEN100
 110 A=VAL(A$):IFA<1ORA>8THEN100
 111 REM CLR
 112 PRINT"[CLS]"
 115 ONAGOTO1000,10000,12000,4000,2000,3000,5000,20000
 120 END
 1000 REM*******SET UP NEW FILE*********
 1001 IFF1=0THEN1055
 1009 REM CLR-PUR
 1010 PRINT "[CLS][PU]THIS WILL ERASE EXISTING FILE"
 1011 REM RED-  6*CRD
 1012 PRINT"[RD][CD][CD][CD][CD][CD][CD][CD]    CONTINUE (Y/N)
 1030 GET A$:IFA$=""THEN1030
 1040 IFA$="N"THEN30
 1050 IFA$<>"Y"THEN1030
 1055 F1=1
 1056 CLR:DIMFN(255),PN$(255),DE$(255),SL(255),RE(255),CP(255),RP(255)
 1057 REM BLU-CLR
 1058 PRINT"[BL][CLS]"
 1059 REM RED
 1060 INPUT"[RD]ENTER TOTAL NUMBER OF ENTRIES
 1065 EN=VAL(EN$):IFEN<1OREN>255THEN1060
 1070 FORN=1TOEN
 1074 REM CLR-RED
 1075 PRINT"[CLS]ENTRY NUMBER ";N
 1079 REM BLU
 1080 PRINT"[BL]ENTER PART NUMBER (EG A1069)
 1090 GET A$:IFA$=""THEN1090
 1092 IFASC(A$)<65ORASC(A$)>90 THEN1090
 1093 REM RED-  2*CRD
 1094 PN$(N)=A$:PRINT"[RD][CD][CD]";A$;
 1095 B$=""
 1096 FORM=1TO4
 1098 GET A$:IFA$=""THEN1098
 1100 IFASC(A$)<48ORASC(A$)>57THEN1098
 1101 PRINTA$;
 1102 B$=B$+A$
 1103 NEXTM:PRINT:PRINT:PN$(N)=PN$(N)+B$:POKE 840000,FF9=1:THEN1075
 1104 FN(N)=VAL(B$)
 1105 REM ORN
 1106 INPUT"[ORJENTER DESCRIPTION";DE$(N)
 1108 IFDE$(N)=""ORLEFT$(DE$(N),1)=" "THEN1105
 1109 DE$(N)=LEFT$(DE$(N),30)
 1110 REM RED-  1*CRD
 1111 INPUT"[RD][CD][CD]ENTER CURRENT STOCK LEVEL  ";SL$
 1112 IFSL$=""THEN1110
 1113 IFASC(SL$)<48ORASC(SL$)>57THEN1110
 1114 SL(N)=VAL(SL$):IFASC(SL$)<48ORASC(SL$)<5THEN...13
 1119 REM BLU-  1*CRD
 1120 INPUT"[BL][CD][CD]ENTER RE-ORDER LEVEL  ";RE$
 1121 IFRE$=""THEN1120
 1122 IFASC(RE$)<48ORASC(RE$)>57THEN1120
 1129 REM PUR-  1*CRD
 1130 INPUT"[PU][CD][CD]ENTER COST PRICE  $";CP$
 1131 IFCP$=""THEN1130
 1132 IFASC(CP$)<48ORASC(CP$)>57THEN1130
 1135 CP(N)=VAL(CP$):IFASC(CP$)<48ORASC(CP$)>57THEN1130
 1139 REM RED-  1*CRD
 1140 INPUT"[RD][CD][CD]ENTER RETAIL PRICE  $";RP$
 1141 IFRP$=""THEN1140
 1142 IFASC(RP$)<48ORASC(RP$)>57THEN1140
 1145 RP(N)=VAL(RP$):IFASC(RP$)<48ORASC(RP$)>57THEN1140
 1149 REM CLR-BLK
 1150 PRINT"[CLS][BK]";PN$(N) +  "+DE$(N)
 1159 REM CRD
 1160 PRINT"[CD]STOCK LEVEL  = ";SL(N)
 1169 REM CRD
 1170 PRINT"[CD]REORDER LEVEL: ";RE(N)
 1179 REM CRD
 1180 PRINT"[CD]COST PRICE     $ ";CP(N)
 1189 REM CRD
 1190 PRINT"[CD]RETAIL PRICE  = $ ";RP(N)
 1199 REM   7*CRD-RED
 1200 PRINT"[CD][CD][CD][CD][CD][CD][CD][CD][RD]  IS THIS ENTRY CORRECT (Y/N)"
 1210 GET A$:IFA$=""THEN1210
 1219 REM CLR-RED BLK
 1220 IFA$="N"THENPRINT"[CLS][CD][RD]ENTRY NUMBER ";N:PRINT"[WH]";PN$(N):GOTO1106
 1225 IFA$<>"Y"THEN1210
 1228 NEXTN
 1240 F1=1
 1250 GOTO50
 2000 REM*****ADD NEW STOCK**************
 2010 IFF1=0THEN50
 2019 REMCLR-BLU
 2020 INPUT"[CLS][BL]HOW MANY ITEMS TO ADD ";TP$
 2030 IFTP$=""THEN2020
 2035 TP=VAL(TP$):IFTP<1 THEN2020
 2038 REM CLR-RED
 2039 PRINT"[CLS][RD]ENTRY NUMBER ";N
 2040 EN=EN+1
 2041 REM CLR-RED-  7*CRD-  7*CRR
 2042 IFEN>254THENEN=EN-1:PRINT"[CLS][RD][CD][CD][CD][CD][CD][CD][CD][CD][CD][CR][CR][CR][CR][CR][CR][CR][CR]FILE FULL"GOTO50
 2045 REM BLU
 2046 PRINT"[BL]ENTER PART NUMBER (EG A1069)"
 2048 GET A$:IFA$=""THEN2048
 2050 IFASC(A$)<65ORASC(A$)>90THEN2046
 2059 REM RED-  2*CRD
 2060 PN$(N)=A$:PRINT"[RD][CD][CD]";A$;
 2070 B$=""
 2075 FORM=1TO4
 2078 GET A$:IFA$=""THEN2078
 2080 IFASC(A$)<48ORASC(A$)>57THEN2078
 2085 PRINTA$;
 2090 B$=B$+A$
 2100 NEXTM:PRINT:PRINT:PN$(N)=PN$(N)+B$
 2110 FN(N)=VAL(B$)
 2120 FORM=1TOEN-1
 2130 IFFN$(N)=PN$(M)THENF2=1:F8=M
 2140 NEXTM
 2149 REM CLR-BLK-  5*CRD-  6*CRR   3*CRD
 2150 IFF2=1THENPRINT"[CLS][BK][CD][CD][CD][CD][CD][CD][CR][CR][CR][CR][CR][CR][CR]NUMBER EXISTS":PRINT"[CD][CO][CD]"PN$(F3);" ";DE$(F3)
 2160 IFF2=1THENFORX=1TO2000:NEXTX:EN=EN-1:F2=0:GOTO2040
 2169 REM ORN
 2170 INPUT"[OR]ENTER DESCRIPTION";DE$(N)
 2172 DE$(N) =LEFT$(DE$(N),30)
 2173 REM RED-  2*CRD
 2174 INPUT"[RD][CD][CD]ENTER CURRENT STOCK LEVEL";SL$
 2176 IFSL$=""THEN2174
 2178 IFASC(SL$)<48ORASC(SL$)>57THEN2174
 2180 SL(N)=VAL(SL$):IFASC(SL$)<48ORASC(SL$)>57THEN2174
 2181 REM BLU-  2*CRD
 2182 INPUT"[BL][CD][CO]ENTER RE-ORDER LEVEL";RE$
 2184 IFRE$=""THEN2182
 2186 IFASC(RE$)<48ORASC(RE$)>57THEN2182
 2188 RE(N)=VAL(RE$):IFASC(RE$)<48ORASC(RE$)>57THEN2182
 2189 REMPUR-  2*CRD
 2190 INPUT"[PU][CD][CD]ENTER COST PRICE  $";CP$
 2192 IFCP$=""THEN2190
 2194 IFASC(CP$)<48ORASC(CP$)>57THEN2190
 2195 CP(N)=VAL(CP$):IFASC(CP$)<48ORASC(CP$)>57THEN2190
 2197 REM RED-  2*CRD
 2198 INPUT"[RD][CD][CD]ENTER RETAIL PRICE  $";RP$
 2200 IFRP$=""THEN2198
 2205 IFASC(RP$)<48ORASC(RP$)>57THEN2198
 2210 RP(N)=VAL(RP$):IFASC(RP$)<48ORASC(RP$)>57THEN2198
 2214 REM CLR-BLK
 2215 PRINT"[CLS][BK]";PN$(N);" ";DE$(N)
 2217 REM CRD
 2218 PRINT"[CD]STOCK LEVEL  = ";SL(N)
 2219 REM CRD
 2228 PRINT"[CD]REORDER LEVEL: ";RE(N)
 2221 REM CRD
 2222 PRINT"[CD]COST PRICE     $ ";CP(N)
 2223 REM CRD
 2224 PRINT"[CD]RETAIL PRICE  = $ ";RP(N)
 2225 REM   7*CRD-RED
 2226 PRINT"[CD][CD][CD][CD][CD][CD][CD][CD][RD]  IS THIS ENTRY CORRECT (Y/N)"
 2227 GET A$:IFA$=""THEN1210
 2230 IFA$="N"THEN2046
 2232 IFA$<>"Y"THEN2227
 2240 NEXTN
```

```
 2250 GOTO50
 3000 REM******REPLENISH**DEPLETE*********
 3010 IFF1=0THEN50
 3015 XX=0
 3019 REM CLR-BLU
 3020 PRINT"[CLS][BLI]ENTER PART NUMBER (EG A1089)"
 3022 GETA$:IFA$=""THEN3022
 3026 IFASC(A$)<65ORASC(A$)>90THEN3022
 3027 REM RED-  2*CRD
 3028 PRINT"[RD][CD][CD]";A$;:TP$=A$
 3030 B$=""
 3031 B$=B$+A$
 3032 FORM=1TO4
 3034 GETA$:IFA$=""THEN3034
 3036 IFASC(A$)<48ORASC(A$)>57THEN3034
 3038 PRINTA$;
 3040 B$=B$+A$
 3044 NEXTM:TP=VAL(B$)
 3045 XX=0
 3050 FORN=1TOEN
 3055 IFB$=PN$(N)THENXX=N:N=EN
 3060 NEXTN
 3064 REM CLR-RED-  4*CRD-  4*CRR
 3065 IFXX=0THENPRINT"[CLS][RD][CD][CD][CD][CD][CR][CR][CR][CR]NO SUCH NUMBER":FO
RX=1TO2000:NEXTX:     GOTO3015
 3069 REM CLR-BLK
 3070 PRINT"[CLS][BK]";PN$(XX);"   ";DE$(XX)
 3074 REM   2*CRD
 3075 PRINT"[CD][CD][CD][CD]STOCK LEVEL   ";SL(XX)
 3079 REM   2*CRR-RED
 3080 INPUT"[CD][CD][RD] NEW STOCK LEVEL     ";SL$
 3085 IFSL$=""THEN3072
 3090 SL(XX)=VAL(SL$):IFSL(XX)<0THEN3070
 3099 REM CLR-  2*CRD-BLU
 3100 PRINT"[CLS][CD][CD][BL]";PN$(XX);"         STOCK NOW   ";SL(XX)
 3109 REM PUR-  2*CRD
 3110 PRINT"[PU][CD][CD]   IS THIS CORRECT (Y/N)"
 3120 GETA$:IFA$=""THEN3120
 3130 IFA$="N"THEN3070
 3140 IFA$<>"Y"THEN3120
 3150 GOTO50
 4000 REM********EDIT FILE**************
 4010 IFF1=0THEN50
 4015 XX=0
 4019 REM CLR-BLU
 4020 PRINT"[CLS][BLI]ENTER PART NUMBER (EG A1069)"
 4022 GETA$:IFA$=""THEN4022
 4023 REM F1
 4024 IFA$="[F1]"THEN50
 4026 IFASC(A$)<65ORASC(A$)>90THEN4022
 4027 REM RED-  2*CRD
 4028 PRINT"[RD][CD][CD]";A$;:TP$=A$
 4030 B$=""
 4032 B$=B$+A$
 4035 FORM=1TO4
 4038 GETA$:IFA$=""THEN4038
 4040 IFASC(A$)<48ORASC(A$)>57THEN4038
 4042 PRINTA$;
 4044 B$=B$+A$
 4048 NEXTM:TP=VAL(B$)
 4050 FORN=1TOEN
 4052 IFB$=PN$(N)THENXX=N:N=EN
 4058 NEXTN
 4059 REM CLR-BLK-  3*CRR-  5*CRD
 4060 IFXX=0THENPRINT"[CLS][RD][CD][CD][CD][CD][CD][CR][CR][CR][CR]NO SUCH NUMBER":FO
RZ=1TO2000:NEXTZ:GOTO4015
 4064 REM CLR-PUR
 4065 PRINT"[CLS][PU]   F1 TO CHANGE ANY OTHER TO CONT."
 4069 REM CRD-BLK
 4070 PRINT"[CD][BK]PART NUMBER: ";PN$(XX)
 4072 GETA$:IFA$=""THEN4072
 4073 REM F1
 4074 IFA$<>"[F1]"THEN4100
 4075 REM CRU
 4076 PRINT"[CU]"
 4077 REM CRU-RED
 4078 INPUT"[CU][RD]PART NUMBER: ";PN$(XX)
 4079 IFPN$(XX)=""THEN4070
 4082 IFASC(LEFT$(PN$(XX),1))>90THEN4070
 4084 IFASC(LEFT$(PN$(XX),1))<65THEN4078
 4085 IFLEN(PN$(XX))>5THEN4078
 4088 PN(XX)=VAL(RIGHT$(PN$(XX),4))
 4090 IFPN(XX)<1THEN4070
 4099 REM BLK
 4100 PRINT"[BK]DESCRIPTION  ";DE$(XX)
 4105 GETA$:IFA$=""THEN4105
 4119 REM F1
 4120 IFA$<>"[F1]"THEN4200
 4127 REM CRU
 4128 PRINT"[CU]"
 4129 REM CRU-RED
 4130 INPUT"[CU][RD]DESCRIPTION  ";DE$(XX)
 4135 DE$(XX)=LEFT$(DE$(XX),30)
 4136 IFDE$(XX)=""ORLEFT$(DE$(XX),1)=" "THEN4130
 4199 REM BLK
 4200 PRINT"[BK]STOCK LEVEL  ";SL(XX)
 4205 GETA$:IFA$=""THEN4205
 4209 REM F1
 4210 IFA$<>"[F1]"THEN4225
 4214 REM CRU
 4215 PRINT"[CU]"
 4219 REM CRU-RED
 4220 INPUT"[CU][RD]STOCK LEVEL: ";SL(XX)
 4223 IFSL(XX)<0THEN4220
 4224 REM BLK
 4225 PRINT"[BK]RE-ORDER LEVEL: ";RE(XX)
 4226 GETA$:IFA$=""THEN4225
 4227 REM F1
 4228 IFA$<>"[F1]"THEN4240
 4229 REM CRU
 4230 PRINT"[CU]"
 4231 REM CRU-RED
 4232 INPUT"[CU][RD]RE-ORDER LEVEL:  ";RE(XX)
 4233 IFRE(XX)<0THEN4232
 4239 REM BLK
 4240 PRINT"[BK]COST PRICE  $";CP(XX)
 4250 GETA$:IFA$=""THEN4250
 4259 REM F1
 4260 IFA$<>"[F1]"THEN4280
 4263 REM CRU
 4264 PRINT"[CU]"
 4265 REM RED-CRU
 4266 INPUT"[RD][CU]COST PRICE  $";CP(XX)
 4270 IFCP(XX)<0THEN4265
 4279 REM BLK
 4280 PRINT"[BK]RETAIL PRICE  $";RP(XX)
 4290 GETA$:IFA$=""THEN4290
 4299 REM F1
 4300 IFA$<>"[F1]"THEN4350
 4304 REM CRU
 4305 PRINT"[CU]"
 4309 REM RED-CRU
 4310 INPUT"[RD][CU]RETAIL PRICE  $";RP(XX)
 4320 IFRP(XX)<0THEN4310
 4349 REM PUR-  2*CRD
 4350 PRINT"[PU][CD][CD]F1 TO RETURN TO MENU"
 4359 REM BLU
 4360 PRINT"[BLI]ANY OTHER TO CONTINUE"
 4370 GETA$:IFA$=""THEN4370
 4379 REM F1
 4380 IFA$="[F1]"THEN50
 4390 GOTO4000
 5000 REM********PRINT-OUT************
 5005 IFF1=0THEN50
 5019 REM RED-CRD BLU
 5020 PRINT"[RD][CD]       1  [BLI]CURRENT STOCK"
 5029 REM RED-CRD BLU
 5030 PRINT"[RD][CD]       2  [BLI]SELECTED ITEMS"
 5039 REM RED-CRD BLU
 5240 PRINT"[RD][CD]       3  [BLI]RE-ORDER LIST"
 5049 REM RED-CRD BLU
 5050 PRINT"[RD][CD]       4  [BLI]RETURN TO MENU"
 5059 REM BLK-  7*CRD
 5060 PRINT"[BK][CD][CD][CD][CD][CD][CD][CD][CD][CD][CD]SELECT FOR PRINT-OUT"
 5070 GETA$:IFA$=""THEN5070
 5080 A=VAL(A$):IFA<1ORA>4THEN5070
 5090 ONAGOSUB6000,6200,6400,6340
 5100 GOTO50
 6000 REM*******PO CURRENT STOCK*********
 6004 GOSUB8000:GOSUB30000: REM SORT
 6005 OPEN4,4
 6006 PRINT#4,"STOCK LIST"
 6007 PRINT#4,"-----------"
 6008 PRINT#4,:PRINT#4,
 6010 PRINT#4,"PART NO.          DESCRIPTION          SL   RL   CP"
 6011 PRINT#4,"      RP"
 6015 PRINT#4,"---- ----          -----------          --   --   ----";
 6016 PRINT#4,"     ----"
 6017 PRINT#4:PRINT#4
 6020 FORXX=1TOEN
 6025 N=ZX(XX)
 6030 PRINT#4,CHR$(16)"01"+PN$(N);CHR$(16)"11"+DE$(N);
 6050 PRINT#4,CHR$(16)"45";SL(N);CHR$(16)"58";RE(N);
 6060 PRINT#4,CHR$(16)"56";CP(N);CHR$(16)"65";RP(N)
 6070 NEXTXX:CLOSE4
 6100 GOSUB41000:RETURN
 6200 REM****PO SELECTED ITEMS**********
 6202 YY=0:YZ=0
 6204 REM CLR-  3*CRR-  3*CRD-RED
 6205 INPUT"[CLS][CR][CR][CR][CD][CD][CD][RD]ENTER PART NUMBER";TP$
 6210 TP=VAL(RIGHT$(TP$,4))
 6215 XX=0:YZ=0
 6220 FORN=1TOEN
 6230 IFTP=PN(N)THENXX=N:N=EN:YZ=1
 6240 NEXTN
 6241 REM CLR-BLK-  5*CRD-  5*CRR
 6242 IFYZ=0THENPRINT"[CLS][BK][CD][CD][CD][CD][CD][CR][CR][CR][CR][CR]NO SUCH NU
MBER":FORZ=1TO2800:NEXTZ:GOTO6205
 6245 IFYY=1THENOPEN4,4:GOTO6265
 6250 OPEN4,4
 6260 PRINT#4,"PART NO.          DESCRIPTION          SL   RL   CP",
 6264 PRINT"[CU]"
 6265 PRINT#4,"      RP"
 6270 PRINT#4,"---- ----          -----------          --   --   ----";
 6275 PRINT#4,"     ----"
 6280 PRINT#4:PRINT#4
 6285 N=XX
 6290 PRINT#4,CHR$(16)"01"+PN$(N);CHR$(16)"11"+DE$(N);
 6295 PRINT#4,CHR$(16)"45";SL(N);CHR$(16)"58";RE(N);
 6298 PRINT#4,CHR$(16)"56";CP(N);CHR$(16)"65";RP(N)
 6299 CLOSE4
 6300 REM CLR-BLU
 6301 YY=1:PRINT"[CLS][BLI]ANY MORE (Y/N)"
 6310 GETA$:IFA$=""THEN6310
 6320 IFA$="Y"THENYY=1:GOTO6285
 6330 IFA$<>"N"THEN6310
 6340 RETURN
 6400 REM******RE-ORDER LIST**********
 6405 GOSUB8000:REM SORT
 6406 XX=0:OPEN4,4:YY=0
 6407 IFYY=0THENPRINT#4,"RE-ORDER"
 6408 IFYY=0THENPRINT#4,"---------"
 6409 PRINT#4,
 6410 PRINT#4,
 6412 PRINT#4,"PART NO.          DESCRIPTION          TOP/UP REQD."
 6414 PRINT#4,
 6420 FORKK=1TOEN
 6425 N=ZX(KK)
 6430 IFSL(N)>=RE(N)THEN6800
 6431 YY=1
 6660 PRINT#4,CHR$(16)"01"+PN$(N);CHR$(16)"11"+DE$(N);
 6670 PRINT#4,CHR$(16)"50";(RE(N)-SL(N))
 6800 NEXTKK
 6810 CLOSE4:GOSUB42000
 6820 RETURN
 8000 REM***SUB/ROUTINE SORT ALPHA****
 8004 REM CLR-BLU-  4*CRR-  5*CRD RED
 8005 PRINT"[CLS][BLI][CR][CR][CR][CR][CD][CD][CD][CD][CD][GD]1  [RD]NUMERIC ORDER
 8009 REM BLU-  4*CRR-  2*CRD RED
 8010 PRINT"[BLI][CR][CR][CR][CR][CD][CD]2  [RD]ALPHA.. ORDER"
 8019 REM BLK- 10*CRD
 8020 PRINT"[BK][CD][CD][CD][CD][CD][CD][CD][CD][CD][CD][CD][CD]ENTER CHOICE.."
 8030 GETA$:IFA$=""THEN8030
 8040 A=VAL(A$)
 8050 ONAGOTO8060,9000
 8060 IFF5=1THENRETURN
 8069 REM BLK
 8070 PRINT"[BK]   SORTING.... PLEASE WAIT!";:     REM*******NUMERIC SORT**********
 **
 8071 ZY=99999
 8072 FORP=1TOEN
 8073 ZA(P)=PN(P):NEXTP
 8075 ZY=PN(1)+1
 8080 FORI=1TOEN
 8085 FORN=1TOEN
 8088 IFZA(N)<ZYTHENZY=ZA(N):ZX(I)=N
 8089 NEXTN
 8090 P=ZX(I)
```

PROGRAM FILE

```
 8091 ZA(P)=999999
 8092 ZV=99998
 8094 NEXTI
 8095 F5=1:F6=0:RETURN
 9002 IFF6=1THENRETURN
 9004 REM BLK
 9005 PRINT"[BK]   SORTING.... PLEASE WAIT!";     REM******ALPHA-SORT***********
 9006 P=1
 9006 FORI=65TO90
 9009 FORN=1TOEN
 9010 IFASC(DE$(N))=ITHENZA(P)=N:P=P+1
 9020 NEXTN
 9030 NEXTI
 9035 F6=1:F5=0
 9100 RETURN
 10000 REM******LOAD FILE FROM DISK******
 10001 CLR:DIMPN(255),PN$(255),DE$(255),SL(255),RE(255),CP(255),RP(255)
 10002 DIMZA(255),ZX(255)
 10005 FI$=""
 10009 REM CLR-BLU RED
 10010 INPUT"[CLS][BLUENTER FILENAME[RD]  ";FI$
 10020 IFFI$=""THENI0000
 10029 REM CLR-PUR
 10030 PRINT"[CLS]IPU]   INSERT DISK"
 10033 REM RED- 10*CRD-  5*CRR
 10040 PRINT"[RD][CD][CD][CD][CD][CD][CD][CD][CD][CD][CD][CD][CD][CR][CR][CR][CR][CR]PRES
S SPACE WHEN READY"
 10050 GETA$:IFA$<>" "THEN10050
 10060 POKE53280,5:POKE53281,5
 10069 REM CLR-WHT
 10070 PRINT"[CLS][WH]     LOADING  ";FI$
 10080 OPEN1,8,3,"0:"+FI$+",SEQ,R"
 10090 INPUT#1,EN,FI$
 10100 FORN=1TOEN
 10110 INPUT#1,PN(N),PN$(N),DE$(N),SL(N),RE(N),CP(N),RP(N)
 10115 NEXTN
 10120 CLOSE1:FI=1:        GOTO50
 12002 REM******SAVE FILE TO DISK********
 12005 FI$=""
 12010 IFFI=0THEN50
 12019 REM BLU-CLR
 12020 INPUT"[BLU[CLS]ENTER FILENAME";FI$
 12030 IFFI$=""THEN12020
 12039 REM CLR-PUR
 12040 PRINT"[CLS]IPU]    INSERT DISK"
 12049 REM  10*CRD-  4*CRR
 12050 PRINT"[CD][CD][CD][CD][CD][CD][CD][CD][CD][CD][CD][CR][CR][CR][CR]PRESS SPACE
WHEN READY"
 12060 GETA$:IFA$=""THEN12060
 12070 POKE53280,2:POKE53281,2
 12079 REM CLR-WHT
 12080 PRINT"[CLS][WH]  SAVING ";FI$
 12090 OPEN1,8,3,"@0:"+FI$+",SEQ,W"
 12100 A$=CHR$(13)+""
 12110 PRINT#1,EN;A$;FI$
 12120 FORN=1TOEN
 12130 PRINT#1,PN(N);A$;PN$(N);A$;DE$(N)
 12140 PRINT#1,SL(N);A$;RE(N);A$;CP(N);A$;RP(N)
 12145 NEXTN
 12150 CLOSE1:GOTO30
 20000 REM******CLEAR/EXIT**********
 20009 REM CLR-BLK-  8*CRD RED
 20010 PRINT"[CLS][BK][CD][CD][CD][CD][CD][CD][CD][CD][CD][CD][CD][CD][CD][CD]      F1
  [WH]TO CLEAR FILE"
 20019 REM BLK-  3*CRD RED
 20020 PRINT"[BK][CD][CD][CD]      F3    [RD]EXIT PROGRAM  "
 20030 GETA$:IFA$=""THEN20030
 20039 REM F1
 20040 IFA$="[F1]"THENRUN
 20049 REM F3
 20050 IFA$<>"[F3]"THEN20030
 20060 FORN=100TO0STEP-1
 20069 REM BLK-CLR
 20070 PRINT"[BK][CLS]";N
 20080 GETA$:IFA$<>""THENRUN
 20090 NEXTN
 20100 SYS64738
 20200 END
 30000 REM******KEY TO PRINT-OUTS**********
 30010 OPEN4,4
 30015 PRINT#4,:PRINT#4,
 30016 PRINT#4,:PRINT#4,
 30020 PRINT#4,"*****************************"
 30030 PRINT#4,"*  SL.....STOCK LEVEL*"
 30040 PRINT#4,"*  RL.....RE-ORDER LEVEL*"
 30050 PRINT#4,"*  CP.....COST PRICE $  *"
 30060 PRINT#4,"*  RP...RETAIL PRICE $  *"
 30065 PRINT#4,"*****************************"
 30068 PRINT#4,:PRINT#4,
 30070 CLOSE4
 30080 RETURN
 40000 REM******CHECK FOR ENTRY**********
 40010 A=VAL(B$)
 40015 FORNN=1TOEN
 40019 REM CLR-RED
 40020 IFA=PN(NN)THENPRINT"[CLS][RD]NUMBER EXISTS":FORN=1TO2000:NEXTN:F9=1:RETURN
 40030 NEXTNN:F9=0
 40040 RETURN
 41000 REM******TOTAL STOCK VALUE********
 41010 TC=0:TR=0
 41020 FORNN=1TOEN
 41030 TC=TC+(CP(NN)*SL(NN))
 41040 TR=TR+(RP(NN)*SL(NN))
 41050 NEXTNN
 41060 OPEN4,4
 41065 PRINT#4,:PRINT#4,
 41070 PRINT#4,:PRINT#4,"....TOTAL STOCK VALUE"
 41080 PRINT#4,"
 41090 PRINT#4,"RETAIL..... $ ";(INT(TR*100))/100
 41100 PRINT#4,"COST..... $ ";(INT(TC*100))/100
 41110 CLOSE4:RETURN
 42000 REM******TOTAL RE-ORDER VALUE****
 42010 RX=0:RV=0
 42020 FORNN=1TOEN
 42030 IFSL(NN)>=RE(NN)THEN42050
 42040 RX=RX+(CP(NN)*(RE(NN)-SL(NN)))
 42050 RV=RV+(RP(NN)*(RE(NN)-SL(NN)))
 42060 NEXTNN
 42070 OPEN4,4
 42075 PRINT#4,:PRINT#4,
 42080 PRINT#4,:PRINT#4,"     TOTAL RE-ORDER VALUE"
 42090 PRINT#4,"
 42100 PRINT#4,:PRINT#4,"RETAIL.....$ ";(INT(RV*100))/100
 42110 PRINT#4,"COST.....$ ";(INT(RX*100))/100
 42120 CLOSE4:RETURN
 50000 END

READY.
```

APC is interested in programs written in any of the major programming languages for all home and small business micros. When submitting programs please include a cassette or disk version of your program, brief but comprehensive documentation, and a listing on plain white paper — typed if you have no printer.

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Check through the previous Program listings to see the kind of programs we prefer. As a rough guide, original ideas are always welcome, as are good implementations of utilities and applications. Obviously the programs should be well-written, easy to understand, and preferably not too long (remember that other readers have to type them in).

All programs should be fully debugged and your own original, unpublished work.

We prefer to receive programs with a maximum 80-column width printed in emphasised typeface.

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Memo from marketing
To: The hand-picked team
Re: The great and secret anniversary push

Well, strange as it may seem, we survived the Christmas rush — or perhaps spavined shuffle would be a better description — and following the grand vizier's examination of the entrails on the top floor, it turns out that celebration is in order.

(Except for the sales manager, of course, whose metaphorical entrails they were.)

It transpires that, having bent its brains to the problem of counting up to 60 without removing its collective shoes and socks, your board has calculated that our fifth anniversary occurs next month. And naturally enough, it has asked me to run some ideas up the flagpole and try to improve our chances of surviving the next five years — or five minutes, come to that.

Well, where have we been in the last five years? Back in 1981, we were selling clapped-out-8-bit computers at grotesquely-inflated prices. Now we are selling clapped out sort-of-16-bit computers at even-more-grossly-inflated prices (thanks to inflation). Plus ca change, plus c'est la same old rubbish, if you ask me.

But how to celebrate this great anniversary that I have 10 minutes' notice to promote? Simple. The motif is cables . . .

Think back and you will remember that five years ago, we were shipping wonderful systems with Z80 processors, 64k RAM, WordStar, and all that sort of stuff. We were also shipping printers like the Diablo 630 and 1640, which could be used for ballasting the QE2, and also vibrated themselves along the table and into the WPB unless watched carefully and sandbagged in. And NB: we did not supply a cable that connected them.

Those were the days. Caveat emptor, *or* caveat sucker *as we used to call it. Give 'em the machine, give 'em the printer, and then refuse to take phone calls when they panicked about plugging one into another. And then, and then, sell 'em the cable they needed for $80 and* make sure it didn't work properly?

It brings tears to my eyes, thinking of the bank balances we got out of putting right the things we'd done wrong. And we didn't even have to do them wrong on purpose; micro engineers, on the wages we paid in 1981, could be guaranteed to connect every wire in every cable to every other at random to find out if something worked.

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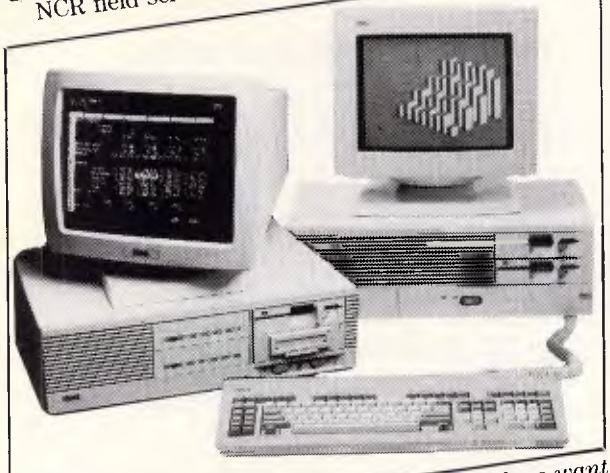

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Please eat the last paragraph after reading, and think ribbons and PVC sheathing!

Yours entangledly,
Charles

This is the lady (?) who concocted the press statement headed 'Learn to mate from any position'. Not surprisingly she (Wendy Giles) works for Dick Smith Electronics — a company known for its vast array of electrical, and other, devices.

This month, Wendy gets APC's *irregular 'Irreverant Press Release' award. And while she gets nothing else except brick-bats, the most inventive reader with suggestions as to the likely content of Wendy's press statement will receive a 12-month subscription to* APC.

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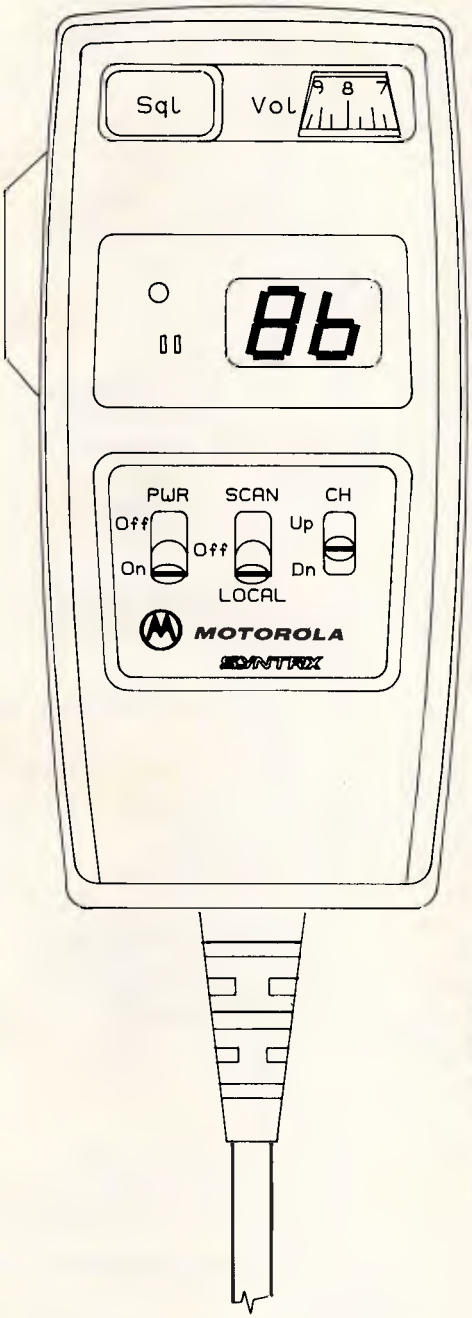

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